



การพัฒนาหนังสืออิเล็กทรอนิกส์เพื่อเสริมสร้างความเข้าใจและการใช้คำศัพท์
ภาษาอังกฤษของนิสิตมหาวิทยาลัยตามกรอบอ้างอิงความสามารถทางภาษา
ของสภายุโรป

Developing an E-Book to Enhance University Students' Vocabulary
Comprehension and Use Based on CEFR

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ได้รับทุนอุดหนุนการวิจัยและนวัตกรรมจากงบประมาณเงินรายได้
ประจำปีงบประมาณ พ.ศ. 2567
คณะมนุษยศาสตร์และสังคมศาสตร์
มหาวิทยาลัยทักษิณ

[2568]



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คำรับรองคุณภาพ

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อ้างอิงความสามารถทางภาษาของสภายุโรปของนิสิตระดับมหาวิทยาลัย

ผู้วิจัย อาจารย์ ดร.จตุพงศ์ โมรา

คณะมนุษยศาสตร์และสังคมศาสตร์ มหาวิทยาลัยทักษิณ ขอรับรองว่ารายงานวิจัยฉบับนี้
ได้ผ่านการประเมินจากผู้ทรงคุณวุฒิแล้ว มีความเห็นว่าผลงานวิจัยฉบับนี้มีคุณภาพอยู่ในเกณฑ์

- ดีเด่น
- ดีมาก
- ดี
- พอใช้
- ควรปรับปรุง

(ผู้ช่วยศาสตราจารย์ ดร.ปาริฉัตร ตู้ดำ)
คณบดีคณะมนุษยศาสตร์และสังคมศาสตร์
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Abstract

Research Title: Developing an E-Book to Enhance University Students' Vocabulary Comprehension and Use Based on CEFR

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In today's era of borderless communication, English proficiency plays a crucial role in both academic and professional success. A fundamental aspect of learning English is vocabulary, particularly vocabulary organized according to the Common European Framework of Reference for Languages (CEFR), which provides internationally recognized standards for language proficiency. This study aimed to create a high-quality, user-friendly e-book, evaluate its effectiveness in enhancing vocabulary knowledge, and identify areas for improvement based on user feedback. The e-book was designed for bachelor's degree students at Thaksin University, aligning vocabulary content with CEFR levels A2–C1 to support flexible and personalized learning.

Expert evaluations rated the e-book as excellent ($\bar{X} = 4.67$; S.D. = 0.58), highlighting its suitability and usability, with minor refinements suggested for content inclusivity and technical features. A paired-sample t-test revealed a statistically significant improvement in students' vocabulary scores after using the e-book ($p = 0.001$), demonstrating its effectiveness as a vocabulary learning tool. User feedback, which indicated a "very satisfied" rating ($\bar{X} = 4.23$; S.D. = 0.69), suggested enhancements in content (e.g., summaries, visuals, and interactive elements), usability features (e.g., note-taking and quizzes), and accessibility to improve the overall user experience. These findings underscore the potential of the e-book as a valuable resource for CEFR-aligned vocabulary acquisition while providing insights for iterative refinement to better meet learner needs.

Keywords: CEFR-aligned vocabulary, E-book development, Vocabulary acquisition, English language learning, Digital learning tools

บทคัดย่อ

หัวข้อวิจัย: การพัฒนาหนังสืออิเล็กทรอนิกส์เพื่อเสริมสร้างความเข้าใจและการใช้คำศัพท์ภาษาอังกฤษของนิสิตมหาวิทยาลัยตามกรอบอ้างอิงความสามารถทางภาษาของสภายุโรป

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ในยุคของการสื่อสารไร้พรมแดนในปัจจุบัน ความสามารถทางภาษาอังกฤษมีบทบาทสำคัญอย่างยิ่งต่อความสำเร็จทั้งในด้านวิชาการและวิชาชีพ หนึ่งในปัจจัยพื้นฐานของการเรียนรู้ภาษาอังกฤษคือคำศัพท์ โดยเฉพาะคำศัพท์ที่จัดหมวดหมู่ตามกรอบอ้างอิงความสามารถทางภาษาของสภายุโรป Common European Framework of Reference for Languages (CEFR) ซึ่งเป็นมาตรฐานที่ได้รับการยอมรับในระดับนานาชาติในการวัดความสามารถทางภาษา งานวิจัยนี้มีวัตถุประสงค์เพื่อสร้างหนังสืออิเล็กทรอนิกส์ (E-book) ที่มีคุณภาพสูง ใช้งานง่าย ประเมินประสิทธิผลในการเพิ่มพูนความรู้ด้านคำศัพท์ และระบุจุดที่ควรปรับปรุงจากข้อเสนอแนะของผู้ใช้ หนังสืออิเล็กทรอนิกส์นี้ออกแบบมาสำหรับนักศึกษาระดับปริญญาตรีของมหาวิทยาลัยทักษิณ โดยเนื้อหาคำศัพท์สอดคล้องกับระดับ CEFR ตั้งแต่ A2 ถึง C1 เพื่อส่งเสริมการเรียนรู้ที่ยืดหยุ่นและเหมาะสมกับแต่ละบุคคล

จากการประเมินโดยผู้เชี่ยวชาญ พบว่าหนังสืออิเล็กทรอนิกส์นี้อยู่ในระดับดีเยี่ยม (ค่าเฉลี่ย = 4.67; ส่วนเบี่ยงเบนมาตรฐาน = 0.58) โดยเน้นความเหมาะสมและการใช้งานง่าย พร้อมข้อเสนอแนะเล็กน้อยเกี่ยวกับการเพิ่มความครอบคลุมของเนื้อหาและคุณสมบัติทางเทคนิค ผลการทดสอบแบบ paired-sample t-test พบว่าคะแนนคำศัพท์ของนักศึกษาหลังใช้งานหนังสืออิเล็กทรอนิกส์ดีขึ้นอย่างมีนัยสำคัญทางสถิติ ($p = 0.001$) แสดงให้เห็นถึงประสิทธิผลของเครื่องมือเรียนรู้คำศัพท์นี้ ข้อเสนอแนะจากผู้ใช้งานซึ่งอยู่ในระดับ "พึงพอใจมาก" (ค่าเฉลี่ย = 4.23; ส่วนเบี่ยงเบนมาตรฐาน = 0.69) มีข้อเสนอแนะให้ปรับปรุงเนื้อหา (เช่น สรุปรูปเนื้อหา ภาพประกอบ และองค์ประกอบเชิงโต้ตอบ) คุณสมบัติการใช้งาน (เช่น การจดบันทึกและแบบทดสอบ) และการเข้าถึง เพื่อยกระดับประสบการณ์ผู้ใช้โดยรวม ผลการศึกษานี้เน้นย้ำถึงศักยภาพของหนังสืออิเล็กทรอนิกส์ในฐานะแหล่งเรียนรู้คำศัพท์ที่สอดคล้องกับ CEFR พร้อมทั้งให้ข้อเสนอแนะสำหรับการพัฒนาอย่างต่อเนื่องเพื่อตอบสนองความต้องการของผู้เรียนได้ดียิ่งขึ้น

คำสำคัญ: คำศัพท์ตามกรอบ CEFR, การพัฒนาหนังสืออิเล็กทรอนิกส์, การเรียนรู้คำศัพท์, การเรียนรู้ภาษาอังกฤษ, เครื่องมือการเรียนรู้ดิจิทัล

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Chapter 1 Introduction

1.0 Overview

This chapter provides an overview of the rationale and problem statement, outlines the research objectives, and discusses the scope and limitations of the study. Additionally, it presents the conceptual framework of the research project, highlights the expected benefits, and concludes with a summary of the chapter.

1.1 Rationale and Statement of Problems

In today's era of borderless communication, knowing English plays a crucial role in the lives of people both now and in the future. A fundamental aspect of learning English is vocabulary, especially vocabulary organized according to the Common European Framework of Reference for Languages (CEFR). This is particularly important for university students. The CEFR provides standardized levels of language proficiency that are internationally recognized and used for language assessment in various standardized tests (Council of Europe, 2018).

University students, especially those graduating in fields such as international relations, international trade, and foreign languages, should possess language skills that enhance their academic and professional attributes. CEFR vocabulary, which ranges from basic to advanced levels, helps boost learners' confidence and English proficiency. This ensures that students have the necessary language knowledge to understand complex academic texts, engage in critical discussions, and produce high-quality written work (North, 2020).

In addition to enhancing academic quality, knowledge of CEFR-based English vocabulary increases students' readiness to enter the global job market, which demands multilingual expertise (Smith, 2019). In this context, learning CEFR vocabulary not only enriches students' academic experiences but also enhances their competitiveness and continuous development as high-quality global workforce.

Currently, technology plays a significant role in all aspects of human life, including education. E-books have become an excellent tool for learning English vocabulary due to their efficiency and the quick access they provide to learning resources. E-books also offer an interactive learning platform, allowing learners to engage with vocabulary in various ways, including accessing definitions and practicing correct pronunciation immediately (Chuang, 2016).

E-books feature multimedia capabilities that combine pronunciation with interactive exercises, enhancing the learning experience and accommodating diverse learning styles (Jones & Lee, 2019). Additionally, e-books can be updated to ensure learners have access to both previous and the latest vocabulary (Wang & Higgins, 2017). The portability of e-books on electronic devices allows learners to practice vocabulary anytime and anywhere, which is particularly beneficial for university students today (Smith, 2018).

Moreover, e-books help learners understand different components of vocabulary, including the word itself, its pronunciation, translation, and example sentences in various contexts, making them a high-quality tool for vocabulary learning (Brown, 2020).

E-books not only facilitate active engagement with vocabulary but also support learning through repeated exposure and contextual usage. According to theories of implicit learning, individuals can acquire complex knowledge—such as language patterns and vocabulary—unconsciously, simply by being exposed to structured input over time (Reber, 1993). This process does not require explicit instruction or conscious memorization, making it particularly effective for vocabulary acquisition in authentic contexts (Seipel, 2011; Wang, 2000). Research in implicit learning demonstrates that learners often internalize grammatical structures and word usage patterns without being able to articulate the underlying rules, which aligns with the naturalistic, interactive experiences provided by modern e-books (Reber, 1993; Martinez, 2021). Therefore, leveraging e-books for frequent, context-rich vocabulary practice is theoretically grounded in the principles of implicit learning, supporting robust and long-lasting language development (Reber, 1993; Wang, 2000; Seipel, 2011).

In conjunction with university's announcement regarding the English proficiency requirements for graduation (English Exit Exam) in 2023, students who enrolled in the

2023 academic year must pass an English proficiency test according to the university's criteria before graduating (Thaksin University, 2023). Based on the researcher's own experience, it was frequently found that more than 50% of the students could not pass the vocabulary test. Moreover, the students themselves reported that they still needed to improve their vocabulary comprehension and use. Therefore, having an e-book as a tool for self-learning vocabulary will help enhance vocabulary skills and support the learning of other English skills.

Using e-books as a tool for students in the Faculty of Humanities and Social Sciences to frequently learn CEFR-aligned vocabulary will result in better vocabulary retention, exposure to example sentences in various contexts, and the ability to practice listening and speaking. With frequent practice, it is expected that students will achieve satisfactory overall English proficiency and be able to score according to the university's standards in various standardized tests.

1.2 Research Objectives

The main objectives of this research project are as follows:

- 1) To create a resourceful and user-friendly e-book designed to enhance the understanding and usage of vocabulary based on the CEFR framework for bachelors' degree students at Thaksin University, Songkhla Campus.
- 2) To evaluate the effectiveness of the e-book in improving vocabulary knowledge by assessing students' performance before and after using the e-book.
- 3) To identify areas for improvement in the e-book based on user feedback to ensure its quality and relevance.

1.3 Scope and Limitation

This study defines its scope and limitations in terms of content, area, population, and sample as follows:

1. **Content:** The vocabulary content will align with CEFR levels A2 to C1, following the English proficiency criteria for Thaksin University graduates as outlined by the university. A total of 120 vocabulary words will be included.
2. **Area:** Data will be collected from students at Thaksin University.
3. **Population:** The target population consists of second-year students at Thaksin University, Songkhla Campus, who are enrolled in the 2024 academic year, totaling 2,774 students.
4. **Sample or Key Informants:** A sample of 110 second-year students who enrolled in two free elective courses taught by the researcher will serve as the key informants for this study.

1.4 The Conceptual Framework of the Research Project

Table 1: The Conceptual Framework of the Research Project

Input Factors	Process	Output
<ul style="list-style-type: none"> - English vocabulary based on the CEFR framework - Theoretical concepts related to creating an effective e-book - Sample e-book for English vocabulary learning - Criteria for evaluating the quality of an e-book - Research on the use of e-books to promote English vocabulary learning 	<p>Design Phase:</p> <ul style="list-style-type: none"> - Structure of the vocabulary knowledge test based on the CEFR framework - Structure of the e-book for university students' vocabulary learning - Structure of the user feedback questionnaire on the e-book - Structure of the interview questions for e-book users 	<p>An e-book for vocabulary learning based on the CEFR framework for university students that is resourceful and user-friendly.</p>

Table 1: The Conceptual Framework of the Research Project (Continued)

Input Factors	Process	Output
	<p>Development Phase:</p> <ul style="list-style-type: none"> - Vocabulary knowledge test based on the CEFR framework - E-book for university students' vocabulary learning - User feedback questionnaire on the e-book (quality assessment) - Interview questions for e-book users <p>Implementation Phase:</p> <ul style="list-style-type: none"> - Data collection on the use of the e-book with at least 110 second-year students from Thaksin University, Songkhla Campus <p>Evaluation Phase:</p> <ul style="list-style-type: none"> - Evaluation of the e-book's quality 	

1.5 Expected Benefits

The expected benefits of this research are anticipated to contribute across multiple sectors:

Academic: Students using the e-book will gain a better understanding and more accurate use of vocabulary, aiding their performance on various standardized tests.

Public: Individuals outside the university who are interested in enhancing their vocabulary can also benefit from the e-book.

Institutional: The e-book will be made available university-wide, ensuring that all students have access to this learning resource.

Innovation: This e-book will act as a pioneering tool for learning CEFR-aligned English vocabulary, supporting ongoing educational innovation.

Integration with Teaching: The e-book will serve as supplementary material for courses *0115131 Principles of English Communication 1* and *0115132 Principles of English Communication 2*, enhancing the curriculum.

1.6 Definition of Terms

Based on the content and focus of the study, the following terms should be clearly defined to ensure clarity and consistency throughout the research.

1. Common European Framework of Reference for Languages (CEFR)

Definition: An international standard for describing language ability, providing a scale of proficiency from A1 (beginner) to C2 (proficient), widely used for curriculum design, assessment, and language teaching.

2. CEFR Vocabulary

Definition: Vocabulary items organized and categorized according to the CEFR proficiency levels (A2 to C1 in your study), ensuring alignment with standardized language benchmarks.

3. E-book

Definition: An electronic book designed for digital devices, featuring interactive elements such as multimedia content, exercises, and instant access to resources, used here as a tool for vocabulary learning.

4. Implicit Learning

Definition: The unconscious acquisition of knowledge, such as language patterns or vocabulary, through exposure and interaction, without deliberate or explicit instruction.

5. Vocabulary Retention

Definition: The ability of learners to remember and recall vocabulary items over time, demonstrating the effectiveness of learning strategies or tools.

6. English Proficiency

Definition: The ability to use the English language effectively and appropriately in academic, professional, and social contexts, often measured using standardized assessments.

7. Standardized Tests

Definition: Formal assessments designed to measure learners' language proficiency in a consistent and objective manner, often aligned with frameworks like the CEFR.

8. Self-Learning

Definition: An approach where learners take initiative and responsibility for their own learning process, often utilizing resources such as e-books independently.

1.7 Summary

In Chapter 1, the researcher presents an overview of the research project, covering the background of the problem, its significance, objectives, scope, conceptual framework, expected benefits, definition of terms. In the following chapter, the researcher will discuss relevant concepts, theories, and a review of the literature and research related to the topic.

Chapter 2 Literature Review and Related Studies

2.0 Overview

Chapter 2 provides an overview of the literature reviewed for the development of the e-book, with key information that may also contribute to the discussion and results sections of the study. The topics covered include: 1) vocabulary learning and the CEFR framework, 2) e-book design and development, and 3) related studies.

2.1 Vocabulary Learning and CEFR

2.1.1 Vocabulary According to the Common European Framework of Reference for Languages (CEFR)

The Common European Framework of Reference for Languages (CEFR) is a globally recognized framework for language proficiency assessment and educational planning, continually updated to reflect modern pedagogical and technological advancements in language learning (Council of Europe, 2023; Council of Europe, 2020). CEFR-aligned vocabulary serves as a foundational component of language acquisition, enabling learners to systematically develop from basic communicative skills (A1-A2) to advanced academic and professional competencies (C1-C2) (Council of Europe, 2025). Recent studies emphasize its role in standardizing vocabulary measurement, particularly through tools like the English Vocabulary Profile (EVP), which maps lexical items to specific CEFR levels based on empirical learner data (Nature Communications, 2024). For instance, research by Milton and Alexiou (2020) demonstrates that vocabulary size correlates strongly with CEFR proficiency benchmarks, with B2 learners typically mastering 4,000–5,000 word families. However, challenges persist in contextual lexical complexity classification, as polysemous words and multi-word expressions require advanced computational models to disambiguate and assign accurate CEFR levels in pedagogical applications (Aleksandrova & Pouliot, 2023).

The CEFR not only provides structured proficiency levels but also introduces the concepts of plurilingual and pluricultural competence. These competencies reflect the ability of learners to draw on all their linguistic and cultural resources to participate effectively in diverse social and educational contexts. Rather than treating languages and cultures as isolated systems, the CEFR emphasizes building a communicative competence where knowledge and experience from various languages and cultures interact and support each other. This approach values flexibility, intercultural mediation, and the ability to adapt communication strategies across different languages and cultural settings, which are increasingly important in today's globalized world (Council of Europe, 2020).

The CEFR vocabulary proficiency levels range from A1 (beginner) to C2 (proficient), providing educators and learners with a structured and systematic framework for vocabulary development and assessment (Council of Europe, 2023). These levels are widely used to guide language instruction, ensuring that learners acquire the vocabulary necessary for effective communication at each stage of proficiency. For higher education, CEFR-aligned vocabulary is particularly significant as it equips university students with the linguistic tools required for academic success and global communication. Research highlights that mastery of CEFR-level vocabulary, especially at B2 and above, is critical for engaging in academic tasks such as reading complex texts, writing essays, and participating in discussions (Khamis et al., 2024). Moreover, the integration of CEFR into university curricula has been shown to help students meet international language standards, thereby enhancing their employability and academic mobility (Waluyo, 2019).

2.1.2 Appropriate CEFR Vocabulary Levels for EFL University Students

Selecting the appropriate CEFR (Common European Framework of Reference for Languages) vocabulary levels for university students learning English as a Foreign Language (EFL) is essential for effective language acquisition and academic success. Research suggests that CEFR levels ranging from B1 (intermediate) to C1 (advanced) are most suitable for university students, as these levels encompass the vocabulary

needed for both general communication and academic tasks, such as reading scholarly articles, writing essays, and participating in discussions (Council of Europe, 2023). A balanced approach considers students' existing proficiency levels and academic needs, ensuring gradual progression while maintaining engagement. Recent studies highlight that B1-level vocabulary provides a foundation for everyday communication, while C1-level vocabulary equips students with advanced lexical tools required for critical thinking and academic discourse (Khamis et al., 2024; Waluyo, 2019). Additionally, integrating CEFR-aligned vocabulary into EFL curricula has been shown to enhance students' readiness for international exams and global career opportunities (Thai EFL University Students' Engagement with CEFR, 2024).

At the B1 level, students learn essential vocabulary for basic social and academic communication, enabling them to understand and produce coherent texts on familiar topics, describe experiences, and express opinions (British Council, 2025; Cambridge English, 2025). As students progress to B2 and C1 levels, they acquire more complex vocabulary necessary for engaging in academic tasks, conducting research, and professional communication. For instance, B2 learners can comprehend technical discussions in their field and produce clear, detailed texts on a wide range of subjects, while C1 learners demonstrate fluency in expressing nuanced ideas and analyzing complex materials (HRMARS, 2024; Thai EFL University Students' Engagement with CEFR, 2024). These proficiency levels align closely with the demands of university education, equipping students to understand, analyze, and convey ideas effectively in academic contexts. The comprehensive vocabulary coverage from these CEFR levels supports EFL university students in achieving academic success and preparing for future career excellence (Council of Europe, 2023; Milton & Alexiou, 2020).

2.2 E-book Design and Development

2.2.1 Concepts of creating an e-book

Creating a high-quality e-book involves several essential processes and concepts that integrate content, design, technology, and legal considerations. At its

core, an e-book is a digital publication designed to provide an engaging and accessible reading experience across various devices.

Content Selection: The foundation of any e-book lies in selecting appropriate materials, multimedia elements, and interactive features. Modern e-books often incorporate text, images, audio, video, and interactive components to enhance engagement and learning outcomes (Almeida & Simoes, 2023; Rosales et al., 2022).

Design and Formatting: A user-friendly design and responsive formatting are critical to ensuring that the e-book is visually appealing and functional on different devices such as tablets, smartphones, and e-readers. This includes considerations for typography, color schemes, navigation menus, and adaptability to screen sizes (Nelson et al., 2021; Padilla et al., 2020).

Technology: Selecting the appropriate e-book format (e.g., ePub, PDF, or mobi) is essential for compatibility with diverse platforms. Additionally, ensuring accessibility features such as text-to-speech functionality or adjustable font sizes can make the e-book more inclusive for all users (Tsai et al., 2024; Brezina & Smith, 2023).

Copyright and Intellectual Property: Addressing copyright and intellectual property issues is crucial when incorporating multimedia elements or third-party content into the e-book. Proper licensing ensures compliance with legal regulations while protecting the rights of creators (Brezina & Smith, 2023).

When these concepts are carefully integrated, they contribute to the development of an engaging and successful e-book that meets the needs of its intended audience.

2.2.1.1 Reading Theories and E-Book Design

The design of effective e-books is informed by established reading theories and cognitive frameworks. For example, Norman's theory of affordances emphasizes the importance of intuitive navigation and visible cues in digital interfaces, ensuring users can easily access features such as search, highlighting, and note-taking (D'Ambra et al., 2016; D'Ambra et al., 2022). Affordance theory, when applied to e-books, highlights how features like portability, searchability, and interactivity enhance user engagement and learning outcomes (D'Ambra et al., 2022).

Additionally, the Technology Acceptance Model (TAM) explains how perceived usefulness and ease of use influence students' willingness to engage with e-books for academic purposes (Luo, 2021; JLTR, 2024). Studies have shown that when students find e-books easy to use and beneficial for their studies, their intention to use these digital resources increases significantly (Luo, 2021).

The Technology Acceptance Model (TAM) provides an invaluable lens for understanding how university students might engage with and benefit from a newly developed E-Book designed to enhance vocabulary comprehension and use based on CEFR standards. According to TAM, two factors—perceived usefulness and perceived ease of use—play a central role in predicting users' willingness to adopt and effectively use an educational technology (Davis, 1989; Venkatesh & Davis, 2000; Zaineldeen et al., 2020).

Relationship of TAM Theory and the E-Book Research

In the context of this research about E-book design, TAM serves as a theoretical framework to explain and predict how students perceive and accept vocabulary E-Book:

1) Perceived Usefulness: The E-Book's alignment with CEFR and its targeted vocabulary development features can facilitate academic achievement and language competence, which students might recognize as highly beneficial for their studies and test performance.

2) Perceived Ease of Use: If the E-Book is intuitively designed, with clear navigation, accessible explanations, and interactive elements, students are more likely to find it user-friendly and be motivated to learn vocabulary independently.

3) The model suggests that positive perceptions in these areas will strengthen students' attitudes towards using the E-Book, increase their intention to utilize it regularly, and ultimately result in greater engagement and vocabulary acquisition.

Integrating TAM into this literature review situates the project within accepted educational technology research, justifies the researcher's focus on user-centered design and evaluation, and supports empirical analysis of students' adoption behaviors. The research may also design survey instruments—for example, Likert items on usefulness and ease of use—to assess TAM constructs in this study, generating

valuable insights for iterative E-Book development and future instructional interventions.

Constructivist theories further support the integration of multimedia and interactive elements in e-books, as these features promote active learning, immediate feedback, and the development of higher-order reading skills (Karakoç Öztürk, 2021). By aligning e-book design with these theoretical perspectives, educators can create digital reading experiences that are engaging, accessible, and effective for vocabulary acquisition and overall language development.

Constructivism theory asserts that learners build their own understanding and knowledge through active engagement with content, personal experiences, reflection, and social interaction. In the context of this research—"Developing an E-Book to Enhance University Students' Vocabulary Comprehension and Use Based on CEFR"—constructivism provides a foundation for designing learning activities that encourage students to explore, experiment, and collaborate as they encounter new vocabulary (Koochang & Paliszkiwicz, 2008; Dennick, 2016; Coursebox, 2025).

Relationship of Constructivism Theory and the E-Book Research

1) The E-Book can be structured to facilitate active learning by embedding interactive vocabulary tasks, authentic reading passages, and opportunities for self-reflection, allowing learners to associate new CEFR-aligned words with their prior knowledge and real-life contexts.

2) Incorporating collaborative exercises, discussion prompts, and scenario-based or project-based activities within the E-Book encourages knowledge construction through dialogue and shared experiences, aligning with constructivist principles.

3) The E-Book's design can support personalized learning paths and adaptive feedback, helping students to test hypotheses about word meanings, revise their understanding, and internalize vocabulary more deeply.

By framing this research within constructivism, the researcher justify the use of interactive digital technologies, student-centered tasks, and active vocabulary learning processes as effective means to support vocabulary development and CEFR achievement among university students.

2.2.2 Creating effective e-books

Creating an effective e-book involves several fundamental principles that focus on content, design, interactivity, and accessibility. These principles ensure that the e-book is engaging, functional, and inclusive for a diverse audience.

Content: The foundation of an e-book's effectiveness lies in well-organized, relevant, and engaging content. High-quality content should be tailored to the target audience's needs and include multimedia elements to enhance understanding (Kitaboo, 2024; HubSpot, 2025).

Design: A smooth and user-friendly design is crucial for readability and usability. This includes clean typography, responsive layouts, and visually appealing images that complement the text while maintaining consistency across devices (Wright Book Associates, 2024; Hurix Digital, 2024).

Interactivity: Interactive features such as hyperlinks, embedded videos, quizzes, and infographics promote active learning and engagement by allowing readers to interact with the content dynamically (Kitaboo, 2024; Wright Book Associates, 2024).

Accessibility: Ensuring accessibility involves incorporating features like alt text for images, closed captions for videos, text-to-speech options, and compatibility with assistive technologies such as screen readers. These features make the e-book inclusive for readers with disabilities or special needs (Hurix Digital, 2024; Kitaboo, 2024).

By integrating these principles effectively, e-books can provide an immersive reading experience while meeting the diverse needs of their audience.

Additionally, an effective e-book should align with clear learning objectives and outcomes to provide a structured and purposeful learning experience. Research emphasizes that e-books designed with specific educational goals foster better engagement and knowledge retention among learners (Hurix Digital, 2024; Kitaboo, 2024). By incorporating well-defined learning outcomes, e-books can guide readers through a logical progression of content while ensuring that the material aligns with their academic or professional needs. These principles, when thoughtfully applied, contribute to creating an e-book that effectively disseminates information, enhances

accessibility, and supports diverse learning styles (HubSpot, 2025; Wright Book Associates, 2024).

2.2.3 Use of E-Books in Vocabulary Learning

E-books play a significant role in enhancing vocabulary learning by incorporating various effective methods that improve language skills. Modern e-books often include multimedia elements such as audio, video, and images, as well as interactive features like clickable definitions, quizzes, and flashcards. These tools create an engaging and immersive learning environment that encourages active participation. For example, learners can interact with vocabulary through dynamic exercises, practice correct pronunciation with embedded audio features, and explore contextual meanings using hyperlinks to additional resources (Hurix Digital, 2024; Kitaboo, 2024). Research shows that such features not only improve vocabulary acquisition but also enhance retention by catering to different learning styles and providing immediate feedback (Chen et al., 2023; Wright Book Associates, 2024).

2.2.4 E-Books and Their Role in Flexible and Personalized Vocabulary Learning

E-books provide unparalleled flexibility, allowing learners to access vocabulary resources anytime and anywhere, which makes self-directed learning more convenient and effective. This flexibility is particularly beneficial for learners with busy schedules or those who prefer asynchronous learning environments (Hurix Digital, 2024; Kitaboo, 2024). Additionally, e-books support personalized learning by offering features such as highlighting text, taking notes, bookmarking pages, and adjusting font sizes or background colors. These customization options cater to the diverse needs and preferences of learners, including those with visual impairments or specific learning styles (Chen et al., 2023; Godwin-Jones, 2023). By aligning with individual preferences, e-books create a more engaging and tailored vocabulary learning experience that promotes better retention and learner autonomy.

2.3 Related Studies

2.3.1 Research on Using E-Books for Vocabulary and English Skills Learning

Norman and Laura (1999) conducted a study to explore the effectiveness of e-books in developing vocabulary knowledge among 20 students. The study aimed to examine how animated features in e-books, combined with vocabulary-building activities, influenced learning and retention of unfamiliar words. Participants were divided into two groups: the control group viewed animated cues to learn the meanings of unfamiliar words, while the experimental group received additional vocabulary-building instructions alongside the animated cues. The findings revealed that students in the experimental group scored six points higher on vocabulary tests compared to those in the control group, demonstrating the value of combining multimedia features with targeted instructional strategies (Higgins & Laura, 1999; Higgins et al., 1999). Recent research has further validated these findings, emphasizing that interactive features such as animations and multimedia cues significantly enhance vocabulary acquisition by engaging learners and providing context for word meanings (Chen et al., 2023; Kitaboo, 2024).

Hashemi and Ismail (2023) conducted a study examining the impact of e-books on vocabulary development among university students. The study involved 95 participants divided into an experimental group using mobile-based e-books and a control group relying on traditional textbooks. Over the course of an academic semester, the experimental group demonstrated significantly higher vocabulary test scores in both post-tests and delayed post-tests compared to the control group. The researchers identified several factors contributing to this improvement, including the flexibility of accessing e-books anytime, the ease of use across multiple devices, and increased learner motivation. Additionally, mobile technology facilitated more frequent encounters with specific vocabulary, thereby enhancing learning and retention capabilities (Xodabande & Hashemi, 2023). These findings align with broader research emphasizing that e-books, with their multimedia features and interactive

tools, create an engaging learning environment that supports vocabulary acquisition (Viola & Miranita, 2022; López-Escribano et al., 2021).

Nasir, Abdullah, and Mirza (2022) conducted a survey-based study to explore university students' perceptions of the role of e-books in vocabulary development. The study involved 45 undergraduate students from the National University of Modern Languages (NUML), Islamabad, who self-assessed their use of e-books for academic purposes, including vocabulary learning. The findings revealed that students had overwhelmingly positive attitudes toward e-books, citing their benefits in accessing electronic dictionaries and online resources. Additionally, students reported that e-books facilitated convenient and efficient vocabulary learning by providing immediate access to definitions, examples, and contextual usage (Nasir et al., 2022). These results align with broader research emphasizing the effectiveness of e-books in enhancing language skills through multimedia tools and interactive features (Chen et al., 2023; Kitaboo, 2024).

Almunawaroh (2020) conducted a comprehensive analysis of global research from 2015 to 2019 to evaluate the effectiveness of e-books in teaching English as a foreign language (EFL). The study identified four key areas where e-books positively impacted learning: 1) increasing student motivation, 2) improving learning outcomes, 3) enhancing reading comprehension, and 4) fostering good reading habits. These findings are consistent with other studies that highlight the role of e-books in creating engaging and interactive learning environments through multimedia features and accessibility (Chen et al., 2023; Nasir et al., 2022). Almunawaroh's research suggests that integrating e-books into teaching materials can significantly enhance English language instruction by aligning content design with pedagogical goals and learner preferences (Hurix Digital, 2024; Kitaboo, 2024).

Jiawook (2021) conducted a study to investigate the impact of digital reading materials on enhancing vocabulary skills and motivating students in English as a Second Language (ESL) and English as a Foreign Language (EFL) contexts. The research also examined the advantages, disadvantages, and overall effectiveness of integrating digital tools for vocabulary learning in classroom settings. A key objective of the study was to encourage students to read more frequently, fostering independent reading

habits and supporting their development as proficient readers. The findings revealed that the use of digital tools significantly improved students' vocabulary acquisition and motivated them to engage in reading activities both inside and outside the classroom. Digital books, in particular, were found to positively influence vocabulary learning by providing interactive features, multimedia content, and accessibility, which collectively enhanced students' overall English language learning experience (Jiawook, 2021; Chen et al., 2023; Hurix Digital, 2024).

Bunmak (2021) conducted a study to explore the role of multimedia in English vocabulary acquisition among university students. The research aimed to: 1) investigate how students acquire English vocabulary through multimedia tools, 2) evaluate their vocabulary development and retention after using these tools, and 3) collect students' opinions on learning vocabulary via multimedia. Data were gathered from 250 undergraduate students across five public and private universities in Chiang Mai through questionnaires, interviews, and vocabulary tests. The findings revealed that: 1) most students had experience with various multimedia-based English vocabulary strategies, expressing a strong preference for tools such as online dictionaries and mobile apps, 2) multimedia-based learning significantly improved students' vocabulary test scores and retention, and 3) students overwhelmingly agreed that multimedia-based learning is an effective and beneficial method for acquiring English vocabulary. These results align with broader research emphasizing the effectiveness of multimedia tools in enhancing vocabulary learning by providing interactive, engaging, and accessible resources (Chen et al., 2023; Hurix Digital, 2024; Kitaboo, 2024).

2.4 Research Gaps for Developing an E-Book to Improve University Students' Comprehension and Usage of CEFR Vocabulary

Based on prior studies and this research objectives, the following research gaps emerge as critical areas for the current study on *"Developing an E-Book to Improve University Students' Comprehension and Usage of CEFR Vocabulary"*:

2.4.1 Limited Focus on CEFR-Aligned Vocabulary in E-Books

Gap: Most existing studies on e-books for vocabulary learning do not explicitly align content with CEFR vocabulary profiles or proficiency levels. For example, while Nasir et al. (2022) used CEFR-based word lists, it focused on mobile apps rather than structured e-books.

Opportunity: This study can bridge this gap by designing an e-book that systematically integrates CEFR vocabulary levels (A1-C2) with interactive features (e.g., quizzes, contextual examples) tailored to university students.

2.4.2 Lack of Long-Term Vocabulary Retention Analysis

Gap: Prior research primarily measures immediate post-test performance but rarely evaluates long-term retention of vocabulary (Chen et al., 2023; Jiawook, 2021).

Opportunity: The second objective (pre- and post-test evaluation) could extend to delayed post-tests to assess retention, addressing a critical gap in understanding sustained vocabulary acquisition.

2.4.3. Insufficient Personalization for University-Level Learners

Gap: Many studies focus on K-12 learners, with limited exploration of e-books tailored to university students' academic needs, such as discipline-specific vocabulary or advanced CEFR levels (B2-C1) (Bunmak, 2021; Hurix Digital, 2024).

Opportunity: This e-book can incorporate academic vocabulary (e.g., AWL words) mapped to CEFR levels, ensuring relevance to university contexts like research, presentations, and professional communication.

2.4.4. Underutilized Feedback Mechanisms for E-Book Improvement

Gap: While Nasir et al. (2022) highlight student perceptions of e-books, few studies systematically use feedback to iteratively refine e-book design.

Opportunity: The third objective (user feedback) can adopt a mixed-methods approach (e.g., surveys, interviews, usage analytics) to identify technical, pedagogical, and content-related improvements, ensuring the e-book's relevance and usability.

2.4.5. Limited Integration of Culturally Adapted CEFR Content

Gap: CEFR's Eurocentric origins may limit its applicability to non-European contexts (Council of Europe, 2023). Studies like Nasir et al. (2022) suggest a need for localized adaptations.

Opportunity: The e-book might contextualize CEFR vocabulary within Thai cultural and academic scenarios (e.g., local idioms, university-specific contexts), enhancing relatability and practical application.

2.4.6. Inadequate Exploration of Mobile-First E-Book Design

Gap: Although Hurix Digital (2024) emphasizes mobile accessibility, most e-book studies do not prioritize responsive design or offline functionality, which are critical for university students in resource-limited settings.

Opportunity: Develop a mobile-optimized e-book with offline access, ensuring compatibility across devices and addressing connectivity challenges noted in Bunmak (2021).

In summary, the e-book developed in this research study is designed to incorporate several innovative and impactful features to enhance university students' comprehension and usage of CEFR vocabulary. These features include:

1. Systematic Integration of CEFR Vocabulary Levels:

The e-book will systematically align vocabulary content with CEFR levels (A1-C2), ensuring learners progress from basic communicative skills to advanced academic and professional competencies. Interactive features such as quizzes and contextual examples will be included to engage students effectively.

2. Incorporation of TOEIC-related Vocabulary:

The e-book will include TOEIC-related vocabulary, such as words from TOEIC vocabulary test, mapped to CEFR levels. This ensures relevance to university contexts like doing standardized exams, presentations, and professional communication.

3. User Feedback for Continuous Improvement:

A mixed-methods approach will be adopted to gather user feedback through surveys, interviews, and usage analytics. This feedback will inform iterative improvements in technical design, pedagogical strategies, and content relevance, ensuring the e-book remains user-friendly and effective.

4. Mobile Optimization with Offline Access:

Designed for compatibility across devices, the e-book will be mobile-optimized with offline access capabilities. This feature addresses connectivity challenges while providing flexibility for self-directed learning anytime and anywhere.

By integrating these features, the e-book aims to serve as a comprehensive and engaging tool that not only improves students' vocabulary knowledge but also supports their academic success and professional readiness.

2.5 Summary

Chapter 2 lays a strong foundation for the current study by synthesizing theoretical insights from CEFR-based vocabulary learning frameworks, practical guidelines on e-book design principles, findings from related studies on multimedia-enhanced learning tools, and identified research gaps that justify the need for this study's innovative approach to developing an effective e-book tailored specifically for university students at Thaksin University.

Chapter 3

Methodology

3.0 Overview

This chapter presents the methodology employed in this study, structured into eight sections: research objectives, research design, research setting, population and sampling, research instruments, data collection procedures, data analysis methods, ethical considerations and a chapter summary.

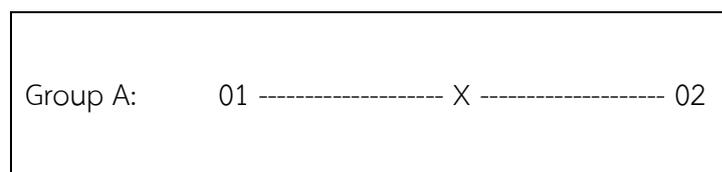
3.1 Research objectives

The primary objectives of this research are:

- 1) To create a resourceful and user-friendly e-book designed to enhance the understanding and usage of vocabulary based on the CEFR framework for bachelors' degree students at Thaksin University, Songkhla Campus.
- 2) To evaluate the effectiveness of the e-book in improving vocabulary knowledge by assessing students' performance before and after using the e-book.
- 3) To identify areas for improvement in the e-book based on user feedback to ensure its quality and relevance.

3.2 Research design

This study employs the One Group Pretest-Posttest Design model.



Where:

01 represents the pretest (measurement taken before using the e-book),

X represents the experimental treatment or the period during which participants use the e-book,

O2 represents the posttest (measurement taken after using the e-book).

3.3 Research setting

The study was conducted at Thaksin University, Songkhla Campus, with data collected from students enrolled in two courses taught by the researcher during January–February 2025.

3.4 Population and sampling

The population of this study consisted of 2,774 second-year students who attended Thaksin University, Songkhla Campus, during the academic year 2023.

The sample group comprised 110 second-year students from the same university and academic year, all of whom were enrolled in two free elective courses taught by the researcher. They were selected using convenience sampling based on their enrollment in these courses.

3.5 Research instruments

The research instruments used in this study include: 1) CEFR Vocabulary for University Students (E-book), 2) Vocabulary Practice Exercises, 3) Vocabulary Test, 4) Expert Evaluation Questionnaire, and 5) E-book Users' Feedback Questionnaire. Each instrument was designed and validated for quality as follows.

3.5.1 Instrument Design and Development

A. CEFR Vocabulary for University Students (E-book)

A vocabulary e-book for university students has been developed in the following steps.

1) Vocabulary list selection

An e-book for university students' vocabulary learning was developed using vocabulary aligned with the CEFR framework, with a focus on words commonly found in standardized exams. The selection process referenced Oxford's CEFR vocabulary lists, and each word was cross-checked by the author for CEFR alignment using the Oxford Online Dictionary. The e-book contains a total of 120 vocabulary words distributed across four levels: 20 words at level A2, 40 words at level B1, 40 words at level B2, and 20 words at level C1, as detailed below.

The 20 vocabulary words at the CEFR A2 level are as follows:

1. arrangement	9. mention	17. schedule
2. celebrate	10. organize	18. sightseeing
3. charity	11. platform	19. strategy
4. condition	12. predict	20. unfortunately
5. definitely	13. prevent	
6. employ	14. raise	
7. feature	15. recipe	
8. laptop	16. remove	

The 40 vocabulary words at the CEFR B1 level are as follows:

1. afford	11. discount	21. investigate
2. analysis	12. economy	22. issue
3. apologize	13. emergency	23. label
4. attract	14. essential	24. occur
5. campaign	15. examine	25. practical
6. careless	16. favor	26. profession
7. consumer	17. function	27. promote
8. convenient	18. hire	28. property
9. current	19. host	29. qualification
10. deliver	20. intend	30. rare

31. receipt	35. scenery	39. technical
32. release	36. shift	40. warn
33. remind	37. starter	
34. reservation	38. supply	

The 40 vocabulary words at the CEFR B2 level are as follows:

1. approach	15. inquiry	29. reasonably
2. broadcast	16. isolate	30. recruit
3. consistently	17. justify	31. refund
4. distinguish	18. loan	32. representative
5. distribution	19. maintain	33. satisfy
6. duration	20. manufacture	34. temporary
7. elderly	21. membership	35. thorough
8. efficiently	22. operate	36. transform
9. equivalent	23. optimistic	37. trust
10. executive	24. overall	38. welfare
11. gradually	25. participant	39. waterproof
12. guarantee	26. popularity	40. withdraw
13. hesitate	27. prompt	
14. indication	28. purchase	

The 20 vocabulary words at the CEFR C1 level are as follows:

1. adjustment	8. earnings	15. subscribe
2. appreciation	9. enterprise	16. supervise
3. cancellation	10. inconvenience	17. suspicious
4. characterize	11. itinerary	18. turnover
5. compensate	12. merchandise	19. upcoming
6. deterioration	13. prevention	20. warehouse
7. dispute	14. shipping	

2) Specification of a word structure

To effectively present each vocabulary word, the following structure can be used:

1. **Word:** The vocabulary word itself.
2. **Part of Speech:** Identify whether the word is a noun, verb, adjective, etc.
3. **Definition:** Provide a clear, concise definition suited to the learner's level.
4. **Example Sentence:** Include a simple sentence using the word in context to illustrate its meaning.
5. **Pronunciation:** Show the phonetic transcription or include an audio link if possible.
6. **Usage Notes:** Any additional information on how the word is used, such as common phrases or collocations.

B. Vocabulary Practice Exercises

Vocabulary practice exercises were designed to assess the e-book users' knowledge after using the e-book. Every 10 words will be followed by a review exercise set, containing 10 questions per set, in the specified format as follows.

Table 2: Specification of a Practice Exercise

Exercise	Content	Format	No. of items
01	A2 (01-10)	Gap-fill	10
02	A2 (11-20)	Gap-fill	10
03	B1 (01-10)	Gap-fill	10
04	B1 (11-20)	Gap-fill	10
05	B1 (11-30)	Gap-fill	10
06	B1 (31-40)	Gap-fill	10
07	B2 (01-10)	Gap-fill	10
08	B2 (11-20)	Gap-fill	10
09	B2 (11-30)	Gap-fill	10

Table 2: Specification of a Practice Exercise (Continued)

Exercise	Content	Format	No. of items
10	B2 (31-40)	Gap-fill	10
11	C1 (01-10)	Gap-fill	10
12	C1 (11-20)	Gap-fill	10

C. Vocabulary Test

This vocabulary test is designed to be used as both a pre-test and a post-test, administered before and after using the e-book. The framework is as follows:

Table 3: Specification of a Vocabulary Test

Vocabulary Test	Content	Format	No. of items
A2	A2 (01-20)	Gap-fill	15
B1	B1 (01-40)	Gap-fill	25
B2	B2 (01-40)	Gap-fill	25
C1	C1 (01-20)	Gap-fill	15

D. Expert Evaluation Questionnaire

This questionnaire was designed by the researcher to obtain experts' evaluations of the quality of the e-book before it was used to collect data. Based on the evaluations, the researcher could make improvements and adjustments to finalize the e-book for use in the study. The structure of the questionnaire is outlined below.

Part 1: Overall Quality of the E-book

This section consisted of five aspects designed to evaluate the quality of the e-book. These aspects included content quality, design and usability, technical accessibility, learning effectiveness, pedagogical alignment, and overall assessment. The statements under each aspect were rated using a 5-point Likert scale.

Part 2: Suggestions for Improvement

Part 2 was designed to gather additional suggestions for improvement. It included two open-ended questions: 1) What specific changes or improvements would you recommend for the e-book's content, structure, or design? and 2) Are there any features or tools you believe should be added to enhance the e-book?

E. E-book Users' Feedback Questionnaire

This questionnaire is designed to get users' feedback after their use of the e-book to get some information for the improvement of the e-book. Below is the structure of the questionnaire.

Part 1. User Profile

These questions help categorize responses based on user demographics and study background.

1. What is your current level of English proficiency? (A2, B1, B2, C1, etc.)
2. What is your main purpose for using this e-book? (e.g., test preparation, language improvement, academic needs, etc.)
3. How often did you use the e-book? (e.g., daily, weekly, only once)

Part 2. Users' Satisfaction towards Using E-book

1. Experience Using E-book

1.1 Content Quality and Relevance

These questions assess the clarity, appropriateness, and utility of the vocabulary and examples provided.

1. To what extent, were the vocabulary words relevant and useful for your learning needs?
2. How clear were the definitions provided for each word?
3. Did the example sentences help you understand the context and usage of each word?

1.2 Learning Experience

1. Did the e-book format make learning vocabulary easy and enjoyable?
2. How engaging were the review exercises after every 10 words?
3. Did the e-book help improve your confidence in using new vocabulary?

1.3 Design and Usability

1. Was the e-book easy to navigate?
2. How would you rate the visual layout of the e-book?
3. Did you experience any technical difficulties while using the e-book?

2. Effectiveness of Learning Outcomes

1. Do you feel your vocabulary knowledge improved after using the e-book?
2. Were you able to recognize or use any of the new vocabulary in real-life situations after studying with the e-book?
3. Would you recommend this e-book to other learners aiming to improve their vocabulary?

3. Overall Satisfaction

How satisfied are you with your overall experience using this e-book? (Scale: Very Satisfied to Very Dissatisfied)

Part 3: Suggestions for Improvement

1. What additional features or content would you like to see in future versions of this e-book?
2. Do you have any specific suggestions to improve the e-book's usability or content?

3.5.2 Instrument Quality Validation

To ensure that the research instruments are appropriately designed and validated for use with the sample group, all instruments were reviewed by three experts who are university lecturers in English. These experts assessed the alignment between the instruments and the research objectives, as well as the relevance and appropriateness of each question or section in relation to the research title and objectives. Validation was conducted using the IOC forms designed by the researcher.

(Please see the forms in the appendices.) Based on their feedback, the researchers made adjustments to the instrument as suggested by the experts before using it to collect data from the participants. After the experts had evaluated, the researchers took the evaluation results to calculate the consistency index to assess the consistency of questions with the set objectives, using the calculation formula of Rovinelli and Hambleton (1997) as follows:

- 1 When it is certain that the question aligns with the objectives
- 0 When there is uncertainty about whether the question aligns with the objectives
- 1 When it is certain that the question does not align with the objectives

Using the formula to find the IOC:

$$IOC = \frac{\sum R}{N}$$

IOC refers to the index of consistency between the question and the objectives

$\sum R$ refers to the sum of the experts' evaluations

N refers to the number of experts

The criteria for considering the Item-Objective Congruence (IOC) of questions, based on the calculated values from the formula, ranged between 0.00 and 1.00.

The details are as follows:

An IOC value of 0.5 or higher indicates that the question is suitable to use

An IOC value below 0.5 indicates that the question should be revised or discarded

Table 4: Report of Instruments' IOC value and Interpretation

Instruments	IOC value	Interpretation
A. CEFR Vocabulary for University Students (E-book)	0.75	Acceptable
B. Vocabulary Practice Exercises	0.82	Acceptable
C. Vocabulary Test	0.88	Acceptable
D. Expert Evaluation Questionnaire	0.78	Acceptable
E. E-book Users' Feedback Questionnaire	0.84	Acceptable

3.5.2 Instrument Adjustment

After the experts validated each instrument, the researcher made improvements based on their suggestions. The final versions of the instruments are presented in the Appendices: CEFR Vocabulary for University Students (E-book) in Appendix A, Vocabulary Practice Exercises in Appendix B, Vocabulary Test in Appendix C, Expert Evaluation Questionnaire in Appendix D, and E-book Users' Feedback Questionnaire in Appendix E.

3.6 Data collection procedures

To collect data for this study, the researcher implemented the following steps:

3.6.1 Participant Briefing and Consent

As the participants were students enrolled in the two courses taught by the researcher, in the second week of January 2025, the researcher informed the participants about the research project including the research title, objectives, and data collection procedures. Participants were then given consent forms to indicate their willingness to participate. Those who consented were administered a vocabulary pretest.

3.6.2 Vocabulary Pretest

The researcher informed the participants who were willing to participate in the study about the rule of doing the vocabulary pretest. All participants use their mobile phones to do the pretest in the google-form mode. They have 60 minutes to finish the test, and they are not allowed to look at each other or look for the answers from the websites or on the internet. The test results are not related to the course scores or grades they are studying. They will know the test results after sending the google form.

3.6.3 Use of E-book

One week after the pretest, the researcher returned to the classroom to explain the study's objectives again, how to use the e-book, and the potential benefits of its use. The researcher also demonstrated how to use the e-book, and how to do the review test of after each set of vocabulary words. Participants were given five weeks to independently study and utilize the e-book. The E-book use starts from the third week of January – the second week of February 2025.

3.6.4 Vocabulary Posttest

After five weeks of e-book use, participants were administered a vocabulary posttest. This assessment aimed to measure any improvement in their vocabulary understanding and usage of the e-book. As in doing the pretest, all participants used their mobile phones to do the posttest in the google-form mode. They have 60 minutes to finish the test, and they are not allowed to look at each other or look for the answers from the websites or on the internet. The test results are not related to the course scores or grades they are studying. They will know the results after the researcher recheck the form and the results were sent to them through their e-mails.

3.6.5 User Feedback Survey

Right after finishing the posttest, participants were asked to complete a feedback questionnaire to assess their satisfaction with the e-book within 20 minutes. Additionally, there were told to answer two open-ended questions at the end of the survey form to get some feedback to improve the e-book.

3.7 Data analysis methods

Data in this study will be analyzed using both quantitative and qualitative methods.

Quantitative Data:

Descriptive statistics (mean, standard deviation, frequency, percentage) will summarize user satisfaction and test performance.

The followings are five scales of e-book satisfaction levels that can be used to interpret the results of each category (Marquette University, Division of Student Affairs, 2023).

Table 5: Average Score Range Interpretation

Average Score Range	Average Score Range Interpretation	
	Experts' Evaluation	Users' Satisfaction
1.00 – 1.80	Very Poor	Very Dissatisfied
1.81 – 2.60	Poor	Dissatisfied
2.61 – 3.40	Fair	Neutral
3.41 – 4.20	Good	Satisfied
4.21 – 5.00	Excellent	Very Satisfied

Inferential statistics, specifically paired sample t-tests, will be used to compare pre- and post-test vocabulary scores to assess the e-book's effectiveness.

Qualitative Data:

Open-ended survey responses will be analyzed using thematic content analysis to identify recurring patterns, suggestions, and concerns.

In doing thematic content analysis, the researcher combines elements of thematic analysis—focused on interpreting patterns and meanings—and content analysis, which may include quantifying theme frequency. The researcher typically follow these steps:

- 1) Familiarization: Reading and understanding the data.
- 2) Coding: Segmenting data into meaningful units using descriptive codes.
- 3) Theme Identification: Grouping codes into candidate themes.
- 4) Review and Refinement: Ensuring internal consistency and thematic relevance.
- 5) Defining and Naming Themes: Clearly articulating the theme's essence.
- 6) Final Analysis: Narrating and supporting findings with direct quotes.

(Braun & Clarke, 2006; Lochmiller, 2021; LoopPanel, 2025)

3.8 Ethical Considerations

All participants were informed of the study's purpose and their rights to withdraw at any time. Data were collected anonymously and stored securely, with results reported in summary form to maintain confidentiality.

3.9 Summary

This chapter has detailed the methodology used in this study across eight sections: research objectives; research design; research setting; participants; research instruments; data collection procedures; data analysis methods; ethical considerations; and chapter summary.

Table 6: Research Tools Used for Collecting Data for Research Design

No.	Research Objectives (ROs)	Research Questions (RQs)	Research Instruments (RIs)	Research Statistics (RSs)
1	To create a resourceful and user-friendly e-book designed to enhance the understanding and usage of vocabulary based on the CEFR framework for bachelors' degree students at Thaksin University, Songkhla Campus.	What features and content should be included in an e-book to effectively teach vocabulary based on the CEFR framework to bachelor's degree students?	1. CEFR alignment rubric 2. Expert validation checklist	1. IOC (Item Objective Congruence) 2. % (Agreement ratio) 3. S.D. (Expert rating consistency)
2	To evaluate the effectiveness of the e-book in improving vocabulary knowledge by assessing students' performance before and after using the e-book.	Does the use of vocabulary e-book significantly improve the vocabulary knowledge of bachelor's degree students?	1. E-book (Intervention) 2. Pretest-Posttest (Vocabulary assessments)	1. % (Score improvement) 2. S.D. (Score validity) 3. Paired t-test (Significance testing)
3	To identify areas for improvement in the e-book based on user feedback to ensure its quality and relevance.	What are the strengths and weaknesses of the e-book as perceived by the students, and what suggestions do they have for improvement	1. User feedback survey 2. Focus group interviews 3. Expert IOC validation	1. IOC (e.g., $\sum \square$ ratings) /experts) 2. % (Satisfaction/issue frequency) 3. Content analysis (Qualitative themes)

Remark: $IOC = (1+0+(-1)+1+1)/5 = 2/5 = 0.40$

Chapter 4

Results

4.0 Overview

This chapter presents the results of the study, organized into three main sections: the overall quality of the e-book, the effectiveness of the e-book as a vocabulary learning tool, and users' feedback for improving the e-book. The findings are based on both quantitative and qualitative data collected through expert evaluations, pre- and post-tests, and user satisfaction surveys.

4.1 Research objectives

The primary objectives of this research are:

- 1) To create a resourceful and user-friendly e-book designed to enhance the understanding and usage of vocabulary based on the CEFR framework for bachelors' degree students at Thaksin University, Songkhla Campus.
- 2) To evaluate the effectiveness of the e-book in improving vocabulary knowledge by assessing students' performance before and after using the e-book.
- 3) To identify areas for improvement in the e-book based on user feedback to ensure its quality and relevance.

4.2 Research results

The results in this study can be categorized into 3 parts in accordance with the research objectives: overall quality of the e-book, the effectiveness of the e-book, and users' feedback for improvement.

4.2.1 Overall Quality of the E-book

The quality of the e-book was assessed by three experts using an evaluation questionnaire focusing on content quality, design and usability, technical accessibility,

learning effectiveness, pedagogical alignment, and overall assessment, as shown in Table 7.

Table 7: Expert Evaluation Questionnaire: Assessment of the E-book

Evaluation Statements	Expert 1	Expert 2	Expert 3	\bar{X}	S.D.	Interpretation
1. Content Quality				4.42	0.87	Excellent
1.1 Relevance of Content				4.33	0.58	Excellent
The appropriateness of the vocabulary used for the intended CEFR levels	5	4	4	4.33	0.58	Excellent
The relevance of the content to learners' needs	5	4	4	4.33	0.58	Excellent
1.2 Quality of Examples				4.67	0.58	Excellent
The accuracy of the example sentences in demonstrating the contextual usage of vocabulary	5	5	4	4.67	0.58	Excellent
1.3 Inclusivity				4.33	1.16	Excellent
The extent to which the content addresses diverse contexts and learner needs (e.g., academic, professional, general)	5	3	5	4.33	1.16	Excellent
1.4 Cultural and Linguistic Appropriateness				4.33	1.16	Excellent
The extent to which the examples and definitions respect cultural differences and use inclusive and appropriate language	5	5	3	4.33	1.16	Excellent
2. Design and Usability				4.67	0.58	Excellent
2.1 Navigation				4.67	0.58	Excellent
The ease of navigation in the e-book	5	4	5	4.67	0.58	Excellent

Table 7: Expert Evaluation Questionnaire: Pre-Assessment of the E-book
(Continued)

Evaluation Statements	Expert 1	Expert 2	Expert 3	\bar{X}	S.D.	Interpretation
2.2 Visual Design				4.67	0.58	Excellent
The effectiveness of the e-book's layout and design in enhancing the learning experience	4	5	5	4.67	0.58	Excellent
3. Technical Accessibility				4.33	1.16	Excellent
The likelihood that learners will not encounter technical difficulties when using the e-book	5	5	3	4.33	1.16	Excellent
4. Learning Effectiveness				4.34	0.29	Excellent
4.1 Engagement				4.00	0.00	Good
The engagement level of the review exercises and activities provided	4	4	4	4.00	0.00	Good
4.2 Knowledge Retention				4.67	0.58	Excellent
The effectiveness of the exercises and examples in the e-book in promoting long-term vocabulary retention	5	4	5	4.67	0.58	Excellent
5. Pedagogical Alignment				4.50	0.87	Excellent
5.1 Learning Objectives				4.67	0.58	Excellent
The alignment of the e-book with established CEFR learning objectives for vocabulary acquisition	5	4	5	4.67	0.58	Excellent
5.2 Adaptability				4.33	1.16	Excellent
The adaptability of the e-book content for diverse learning contexts (e.g., individual study, classroom use)	5	3	5	4.33	1.16	Excellent

Table 7: Expert Evaluation Questionnaire: Pre-Assessment of the E-book
(Continued)

Evaluation Statements	Expert 1	Expert 2	Expert 3	\bar{X}	S.D.	Interpretation
6. Overall Assessment				4.67	0.58	Excellent
6.1 Overall Quality				4.67	0.58	Excellent
The overall quality of the e-book	4	5	5	4.67	0.58	Excellent
6.2 Recommendation				4.67	0.58	Excellent
The recommendation of this e-book for learners at the target CEFR levels	5	4	5	4.67	0.58	Excellent

The results presented in Table 7 indicate that the e-book received high ratings from experts, with all aspects evaluated at an "excellent" level. Among the assessed categories, the highest rating was attributed to the aspect of design and usability (\bar{X} = 4.67; S.D. = 0.58). This category encompassed two subcomponents: navigation (\bar{X} = 4.67; S.D. = 0.58) and visual design (\bar{X} = 4.67; S.D. = 0.58).

The second-highest rating was assigned to the aspect of pedagogical alignment (\bar{X} = 4.50; S.D. = 0.87), which included learning objectives (\bar{X} = 4.67; S.D. = 0.58) and adaptability (\bar{X} = 4.33; S.D. = 1.16).

The third rating pertained to content quality (\bar{X} = 4.42; S.D. = 0.87). This aspect comprised several elements: relevance of content (\bar{X} = 4.33; S.D. = 0.58), quality of examples (\bar{X} = 4.67; S.D. = 0.58), inclusivity (\bar{X} = 4.33; S.D. = 1.16), and cultural and linguistic appropriateness (\bar{X} = 4.33; S.D. = 1.16).

The fourth rating was given to learning effectiveness (\bar{X} = 4.34; S.D. = 0.29). This category included two subcomponents: engagement (\bar{X} = 4.00; S.D. = 0.00) and knowledge (\bar{X} = 4.67; S.D. = 0.58).

The fifth rating focused on technical accessibility (\bar{X} = 4.33; S.D. = 1.16).

In the overall assessment, the e-book was rated at an "excellent" level (\bar{X} = 4.67; S.D. = 0.58). This overall evaluation combined two key factors: overall quality (\bar{X} = 4.67; S.D. = 0.58) and recommendation (\bar{X} = 4.67; S.D. = 0.58).

Content Analysis and Systematic Summary of Experts' Suggestions

The feedback from three experts has been analyzed and summarized systematically, focusing on general insights. The analysis covers content, structure, design, features, and usability of the e-book. (For individual expert recommendations, please see **Appendix F**.)

General Summary of Experts' Suggestions

Strengths

1. Content Quality:

Vocabulary is appropriate for CEFR levels and diverse contexts (academic, professional, general).

Exercises provide opportunities for repeated exposure to vocabulary in various contexts.

Examples are culturally sensitive and linguistically relevant.

2. Structure and Design:

Well-organized content with logical progression (e.g., level-based arrangement).

Easy to read and understand.

3. Adaptability:

Suitable for individual study and classroom use.

Can support group learning, teacher-led instruction, and self-assessment.

4. Practical Application:

Vocabulary is versatile and relevant to real-world scenarios (daily life, academic, professional).

Areas for Improvement

1. Content Enhancements:

Include more localized examples to make vocabulary relatable.

Add Thai translations for vocabulary and example sentences to cater to learners' native language needs. (Already adjusted)

Provide English definitions alongside Thai definitions for clarity. (Already adjusted)

Ensure consistency in exercises (e.g., using the same part of speech for all options). (Already adjusted)

2. Design Improvements:

Add engaging visual elements (e.g., images, diagrams) to enhance appeal.

Include short passages with relevant vocabulary.

3. Interactive Features:

Allow learners to rate exercises or provide feedback on vocabulary sections.

Add space for personal reflection or journaling exercises to encourage active learning.

Create interactive tools like note-taking areas or comment sections.

4. Technical Accessibility:

Address potential compatibility issues with older devices or operating systems.

Ensure offline access to reduce dependency on internet connectivity.

To summarize, the experts provided valuable feedback highlighting the strengths of the e-book while suggesting actionable improvements in content variety, design engagement, interactivity, and accessibility. All three experts recommend the e-book as an effective tool for learners at CEFR levels with minor enhancements needed for broader applicability and user engagement.

To achieve the first research objective—to create a resourceful and user-friendly e-book designed to enhance the understanding and usage of vocabulary based on the CEFR framework for bachelor's degree students at Thaksin University, Songkhla Campus—expert evaluations indicate that the e-book is a high-quality resource that is both suitable and easy to use for learners at CEFR levels A2–C1. It enables students

to learn and practice university-level vocabulary anytime and anywhere. The overall quality of the e-book is rated as excellent ($\bar{X} = 4.67$; S.D. = 0.58), with minor refinements needed in content inclusivity and technical features to further enhance its effectiveness.

4.2.2 The Effectiveness of the E-book

To evaluate the effectiveness of the e-book as a vocabulary learning tool, pre-tests and post-tests were conducted with participants to measure improvements in their vocabulary knowledge. Although 110 students were recruited, only 103 participants completed both pre-test and post-test, and thus their data were included in the final analysis. The results are presented in Table 8.

Table 8: Paired-Sample T-Test Results for Pre-Test and Post-Test Scores

Score	N		S.D.	t	df	p
Pretest	103	31.82	13.285	-12.016	102	0.001
Posttest	103	59.34	18.995			

* Statistically significant at the 0.05 level

The results in Table 8 indicate a statistically significant improvement in vocabulary knowledge after using the e-book as a learning tool. A paired-sample **t-test** was conducted to compare the participants' vocabulary scores before and after using the e-book. The mean pretest score was **31.82 (SD = 13.285)**, while the mean posttest score increased to **59.34 (SD = 18.995)**. The analysis revealed a **t-value of -12.016** with **102 degrees of freedom**, and the difference was statistically significant (**p = 0.001**), indicating that the observed improvement was unlikely due to chance. These findings suggest that the e-book was an effective tool for enhancing vocabulary acquisition among university students.

To achieve the second research objective—to evaluate the effectiveness of the e-book in improving vocabulary knowledge by assessing students' performance before and after using the e-book—a paired-sample t-test was conducted to compare

participants' vocabulary scores before and after using the e-book. The analysis revealed a statistically significant difference ($p = 0.001$), indicating that the e-book is an effective tool for enhancing vocabulary acquisition among university students.

4.2.3 Users' Feedback for the Improvement of the E-book

To identify areas for improvement in the e-book based on user feedback and ensure its quality and relevance, participants were asked to complete a feedback questionnaire to evaluate their satisfaction with the e-book and respond to two open-ended questions at the end of the survey form. Their responses were categorized into three parts: user profile, user satisfaction with the e-book, and suggestions for e-book improvement.

4.2.3.1 User Profile

Under the user profile category, three types of data about the participants were collected: their levels of English proficiency, the main purpose for using the e-book, and the frequency of e-book usage. The details of each subcategory are presented in Tables 9–11 below.

Table 9: Participants' Self-Rated Levels of English Proficiency

CEFR Levels	Frequency	Percentage (%)
A1	3	3.70
A2	23	28.40
B1	19	23.46
B2	13	16.05
C1	2	2.47
C2	1	1.23
Not sure/Don't know	20	24.69
Total	81	100.00

The results in Table 9 show that participants' English proficiency levels ranged from beginner (A1) to advanced (C1), with the majority identifying at the A2 level of proficiency (23 students; 28.40%). The second most common level was B1 (19 students; 23.46%), followed by B2 (13 students; 16.05%). The fourth identified level was A1 (3 students; 3.70%), and the fifth was C1 (2 students; 2.47%). The least identified level was C2 (1 student; 1.23%). Additionally, 20 students indicated that they were unsure or did not know their English proficiency level.

Table 10: Participants' Primary Purposes for Using the E-Book

Purpose	Frequency	Percentage (%)
Test preparation	22	27.16
Language improvement	54	66.67
Academic needs	4	4.94
(Other) Suitable word selection for academic writing	1	1.23
Total	81	100.00

The results in Table 10 indicate that most participants used the e-book for language improvement (54 students; 66.67%). The second most common purpose was using the e-book for test preparation (22 students; 27.16%). The third purpose was using the e-book for academic needs (4 students; 4.94%). The least common purpose was using the e-book for selecting suitable words for academic writing (1 student; 1.23%).

Table 11: Frequency of E-Book Usage Among Participants

How often	Frequency	Percentage (%)
Daily	0	0.00
Weekly	51	62.96
Occasionally	25	30.87
Once	2	2.47
Never	3	3.70
Total	81	100.00

The results in Table 11 reveal that during the five weeks of e-book usage, most participants used the e-book weekly (51 students; 62.96%). The second group reported using the e-book occasionally (25 students; 30.87%). The third group reported using the e-book only once (2 students; 2.47%), while the last group reported never using the e-book (3 students; 3.70%).

4.2.3.2 Users' Satisfaction with the E-book

A user satisfaction survey was conducted to evaluate participants' experiences with the e-book across four dimensions: content quality, learning experience, design and usability, and learning outcomes. The results are presented in Table 12.

Table 12: Users' Satisfaction with the E-book

Users' Satisfaction Questions	\bar{X}	S.D.	Interpretation
1. Content Quality	4.15	0.75	Satisfied
1) To what extent were the vocabulary words relevant and useful for your learning needs, and how satisfied are you with them?	4.09	0.76	Satisfied
2) How clear were the definitions provided for each word, and how satisfied are you with those definitions?	4.21	0.70	Very Satisfied
3) Did the example sentences help you understand the context and usage of each word? How satisfied are you with these examples?	4.16	0.78	Satisfied
2. Learning Experiences	4.12	0.77	Satisfied
1) Did the e-book format make learning vocabulary easy and enjoyable, and how satisfied are you with this format?	4.11	0.73	Satisfied
2) How engaging were the review exercises provided after every 10 words, and how satisfied are you with these exercises?	4.11	0.78	Satisfied
3) Did the e-book help improve your confidence in using new vocabulary, and how satisfied are you with it?	4.15	0.81	Satisfied
3. Design and Usability	4.12	0.81	Satisfied
1) Was the e-book easy to navigate? How satisfied are you with it?	4.10	0.74	Satisfied
2) How would you rate the visual layout of the e-book? How satisfied are you with it?	4.11	0.76	Satisfied
3) Did you experience any technical difficulties while using the e-book? How satisfied are you with it?	4.16	0.93	Satisfied

Table 12: Users' Satisfaction with the E-book (Continued)

Users' Satisfaction Questions	\bar{X}	S.D.	Interpretation
4. Learning Outcomes	4.11	0.77	Satisfied
1) Do you feel that your vocabulary knowledge improved after using the e-book? How satisfied are you with the improvement?	4.09	0.81	Satisfied
2) Were you able to recognize or use any of the new vocabulary in real-life situations after studying with the e-book? How satisfied are you with this progress?	4.09	0.71	Satisfied
3) Would you recommend this e-book to other learners aiming to improve their vocabulary? How satisfied are you with your experience using it?	4.16	0.77	Satisfied
5. Overall Satisfaction	4.23	0.69	Very Satisfied
How satisfied are you with your overall experience using this e-book?	4.23	0.69	Very Satisfied

The results in Table 12 demonstrate that, among the four dimensions of e-book characteristics, participants reported being at the 'satisfied' level for content quality ($\bar{X} = 4.15$; S.D. = 0.75), learning experiences ($\bar{X} = 4.12$; S.D. = 0.77), design and usability ($\bar{X} = 4.12$; S.D. = 0.81), and learning outcomes ($\bar{X} = 4.11$; S.D. = 0.77). Overall, they responded at the 'very satisfied' level for the e-book ($\bar{X} = 4.23$; S.D. = 0.69).

4.2.3.3 Suggestions for E-book Improvement

Based on the answers to open-ended questions at the end of the satisfaction questionnaire, users' suggestions and feedback for improving the e-book can be categorized into three main areas: content enhancements, features and usability improvements, and general feedback on user experience.

1. Content Enhancements

Users emphasized the need for richer and more engaging content. Key suggestions include:

Summaries and Key Points: Provide concise summaries at the end of each chapter to help readers quickly grasp important concepts.

Vocabulary Expansion: Include more vocabulary words, phrases, and example sentences to enhance language learning.

Visual Aids:

- Add more illustrations, diagrams, or colorful elements to make the content visually appealing.
- Include images associated with vocabulary or sentences to aid comprehension.

Interactive Elements:

- Add audio clips for practicing pronunciation, especially for dialogues.
- Use QR codes for accessing supplementary pronunciation guides or speaking tutorials.

Practical Examples: Incorporate real-life examples or relatable scenarios to enhance understanding.

2. Features and Usability Improvements

Users proposed several feature enhancements to improve the functionality and user experience of the e-book:

Interactive Features:

- Introduce note-taking capabilities within the e-book.
- Add interactive exercises or quizzes at the end of each chapter for self-assessment.

Customization Options: Allow users to personalize their learning experience, such as bookmarking or highlighting key sections.

System Improvements: Ensure smoother system performance and accessibility, as some users experienced technical issues.

Annual Updates: Regularly update the content with new materials to keep it

relevant.

3. General Feedback on User Experience

While many users praised the e-book for its quality and usefulness, they also suggested areas for improvement:

Positive Feedback:

- Users found the e-book engaging, easy to read, and practical for daily use.
- Many expressed a desire for similar e-books in the future.

Suggestions for Improvement:

- Simplify complex information by using tables, charts, or diagrams.
- Add cartoon-style illustrations to make learning more fun and relatable.
- Improve system accessibility to address occasional usage disruptions.

Based on users' feedback from the satisfaction questionnaire, suggestions for improving the e-book can be grouped into three main areas: content enhancements, feature and usability improvements, and general user experience feedback. In terms of content, users recommended adding concise chapter summaries, expanding vocabulary with more examples, incorporating visual aids such as images and diagrams, and including interactive elements like audio clips and real-life scenarios to improve engagement and comprehension. For features and usability, users suggested adding note-taking capabilities, interactive quizzes for self-assessment, customization options like bookmarking, and ensuring smoother system performance. They also emphasized the importance of regular content updates to maintain relevance. Regarding general user experience, users praised the e-book's practicality and ease of use but proposed simplifying complex information through tables or charts, adding cartoon-style illustrations for a more enjoyable learning experience, and improving system accessibility to prevent disruptions. Overall, users expressed enthusiasm for similar e-books in the future while highlighting areas for refinement.

To achieve the third research objective—to identify areas for improvement in the e-book based on user feedback to ensure its quality and relevance—users'

responses to the satisfaction questionnaire indicated a "very satisfied" level ($\bar{X} = 4.23$; S.D. = 0.69). However, refinements were suggested in three main areas: content enhancements, feature and usability improvements, and general user experience feedback.

4.3 Summary of results

The findings from this study highlight three key outcomes:

4.3.1 E-book Quality and Usability

The e-book, designed to enhance vocabulary understanding and usage based on the CEFR framework for bachelor's degree students at Thaksin University, was evaluated by experts as a high-quality, user-friendly resource suitable for learners at CEFR levels A2–C1. It allows students to practice university-level vocabulary anytime and anywhere. The overall quality was rated as excellent ($\bar{X} = 4.67$; S.D. = 0.58), with minor refinements suggested for content inclusivity and technical features to further improve its effectiveness.

4.3.2 Effectiveness in Vocabulary Acquisition

A paired-sample t-test comparing students' vocabulary scores before and after using the e-book revealed a statistically significant improvement ($p = 0.001$). This indicates that the e-book is an effective tool for enhancing vocabulary acquisition among university students.

4.3.3 User Feedback and Areas for Improvement

Based on user feedback from a satisfaction questionnaire, the e-book received a "very satisfied" rating ($\bar{X} = 4.23$; S.D. = 0.69). However, users suggested refinements in three main areas: content enhancements (e.g., summaries, visuals, and interactive elements), feature and usability improvements (e.g., note-taking, quizzes, and system stability), and general user experience (e.g., simplifying complex information and improving accessibility).

These results demonstrate the e-book's quality, effectiveness, and potential for further improvement to better meet user needs.

4.4 Summary

This chapter has presented the results of the study, organized into three main sections: the overall quality of the e-book, the effectiveness of the e-book as a vocabulary learning tool, and users' feedback for improving the e-book.

Chapter 5

Summary, Discussion and Conclusion

5.0 Overview

This chapter summarizes the results of the research, discusses the main findings with the other previous studies, concludes what have been found in the studies, and finally presents recommendations and suggestions for future research and studies.

5.1 Summary of Findings

This study, titled “**Developing an E-Book to Enhance University Students’ Vocabulary Comprehension and Use Based on CEFR,**” aimed to achieve three main objectives:

1. *To create a resourceful and user-friendly e-book* designed to enhance the understanding and usage of vocabulary based on the CEFR framework for bachelors’ degree students at Thaksin University, Songkhla Campus.

2. *To evaluate the effectiveness of the e-book* in improving vocabulary knowledge by assessing students' performance before and after using the e-book.

3. *To identify areas for improvement in the e-book* based on user feedback to ensure its quality and relevance.

In alignment with these objectives, the findings are summarized as follows:

1. *E-book Quality and Usability:* The e-book, designed to enhance vocabulary understanding and usage based on the CEFR framework for bachelor’s degree students at Thaksin University, was evaluated by experts as a high-quality, user-friendly resource suitable for learners at CEFR levels A2–C1. It enables students to practice university-level vocabulary anytime and anywhere. The overall quality was rated as excellent (\bar{X} = 4.67; S.D. = 0.58), with minor refinements suggested for content inclusivity and technical features to further improve its effectiveness.

2. *Effectiveness in Vocabulary Acquisition:* A paired-sample t-test comparing students' vocabulary scores before and after using the e-book revealed a statistically

significant improvement ($p = 0.001$). This demonstrates that the e-book is an effective tool for enhancing vocabulary acquisition among university students.

3. User Feedback and Areas for Improvement: Based on user feedback from a satisfaction questionnaire, the e-book received a "very satisfied" rating ($\bar{X} = 4.23$; S.D. = 0.69). However, users suggested refinements in three main areas:

Content Enhancements: Adding summaries, visuals, interactive elements, and real-life examples to improve engagement and comprehension.

Feature and Usability Improvements: Introducing note-taking capabilities, quizzes, system stability improvements, and regular updates to maintain relevance.

General User Experience: Simplifying complex information, improving accessibility, and incorporating cartoon-style visuals for a more enjoyable learning experience.

5.2 Discussion

The findings of this study provide valuable insights into the development, effectiveness, and refinement of the e-book designed to improve university students' comprehension and usage of CEFR vocabulary. The discussion is structured around the three main objectives of the study and contextualized within the literature reviewed in Chapter 2.

5.2.1 E-book Quality and Usability

The expert evaluation of the e-book as a high-quality and user-friendly resource aligns with principles outlined in the literature on e-book design and development. The e-book's suitability for learners at CEFR levels A2–C1 reflects its systematic integration of CEFR-aligned vocabulary, which is critical for enabling students to progress from basic communication skills to advanced academic competencies (Council of Europe, 2023; Milton & Alexiou, 2020). The inclusion of features such as multimedia elements and interactive tools enhances its usability, supporting findings from Almeida & Simoes (2023) that emphasize the importance of engaging content design for effective learning outcomes. Minor refinements suggested by experts, such as improving content inclusivity and technical features, highlight areas for iterative

improvement to ensure the e-book remains relevant and accessible across diverse learner contexts.

5.2.2 Effectiveness in Vocabulary Acquisition

The statistically significant improvement in students' vocabulary scores after using the e-book demonstrates its effectiveness as a learning tool. This result is consistent with prior studies that emphasize the role of interactive features and multimedia elements in enhancing vocabulary acquisition (Chen et al., 2023; Hurix Digital, 2024). The use of a paired-sample t-test provides robust evidence of the e-book's impact on vocabulary learning, supporting research by Hashemi & Ismail (2023), which found similar improvements in vocabulary test scores among university students using mobile-based e-books. Furthermore, this finding underscores the importance of aligning vocabulary content with CEFR levels to address academic needs effectively (Khamis et al., 2024; Waluyo, 2019).

5.2.3 User Feedback and Areas for Improvement

The "very satisfied" rating from users reflects their overall positive experience with the e-book, particularly its practicality and ease of use. However, feedback suggesting refinements in content enhancements, usability features, and general user experience aligns with gaps identified in related studies. For instance:

Content Enhancements: Users' suggestions for adding summaries, visuals, and interactive elements align with research emphasizing the importance of multimedia integration for engaging learners (Kitaboo, 2024; Wright Book Associates, 2024). Incorporating real-life examples further supports contextual learning, as highlighted by Nasir et al. (2022).

Feature and Usability Improvements: Recommendations for note-taking capabilities, quizzes, and system stability improvements are consistent with findings by Bunmak (2021), which emphasize the role of interactive tools in promoting active learning. Regular updates to maintain relevance also address gaps noted in Hurix Digital (2024) regarding content sustainability.

General User Experience: Simplifying complex information and improving accessibility align with best practices for inclusive e-book design (Godwin-Jones, 2023).

Suggestions for cartoon-style visuals reflect a preference for engaging formats that cater to diverse learning styles (Chen et al., 2023).

5.2.4 Implications for Future Development

The results highlight several opportunities for enhancing the e-book's effectiveness:

Iterative Refinement: Incorporating user feedback through mixed-methods approaches can ensure continuous improvement in technical design and pedagogical strategies.

Mobile Optimization: Developing offline access capabilities can address connectivity challenges faced by university students in resource-limited settings (Bunmak, 2021).

Localized Content: Contextualizing CEFR vocabulary within Thai cultural scenarios can enhance relatability and practical application (Nasir et al., 2022).

Overall, this study demonstrates that a well-designed e-book aligned with CEFR vocabulary levels can significantly enhance university students' language acquisition while providing flexibility and personalized learning experiences. By addressing areas for improvement identified through expert evaluations and user feedback, future iterations of the e-book can further optimize its quality, relevance, and impact on academic success.

5.3 Conclusion

This study, titled “**Developing an E-Book to Improve University Students' Comprehension and Usage of CEFR Vocabulary,**” successfully achieved its objectives of creating a high-quality e-book, evaluating its effectiveness in vocabulary acquisition, and identifying areas for improvement based on user feedback. The e-book was rated as excellent by experts ($\bar{X} = 4.67$; S.D. = 0.58) and demonstrated statistically significant effectiveness in improving students' vocabulary knowledge ($p = 0.001$). User feedback highlighted a "very satisfied" rating ($\bar{X} = 4.23$; S.D. = 0.69) while suggesting refinements in content, features, and usability to enhance its quality further. These findings underscore the e-book's potential as a valuable tool for university-level

vocabulary learning, aligning with CEFR standards and supporting flexible, personalized learning experiences. The study contributes to the growing body of research on integrating digital tools into language education and highlights opportunities for future development to address user needs more comprehensively.

5.4 Recommendations and Suggestions

Based on the findings of this study, the following recommendations are proposed.

5.4.1 For E-Book Development

Content Enhancements:

Include concise chapter summaries, real-life examples, and additional vocabulary words mapped to CEFR levels A2–C1.

Integrate multimedia elements such as images, diagrams, audio clips for pronunciation practice, and interactive exercises to improve engagement and comprehension.

Feature Improvements:

Add note-taking capabilities, bookmarking options, and interactive quizzes for self-assessment at the end of each chapter.

Ensure system stability and compatibility across devices while providing offline access for greater flexibility.

Regular Updates:

Periodically update the e-book content to include new vocabulary and features that align with evolving academic needs and technological advancements.

5.4.2 For Future Research

Long-Term Retention Analysis:

Conduct delayed post-tests to evaluate the long-term retention of vocabulary learned through the e-book.

Cultural Adaptation:

Contextualize CEFR vocabulary within Thai cultural scenarios to enhance relatability and practical application for local learners.

Broader Implementation Studies:

Investigate the effectiveness of similar e-books across different academic disciplines or institutions to validate their scalability and adaptability.

5.4.3 For Educators and Institutions*Integration into Curricula:*

Incorporate the e-book into language courses as a supplementary resource to support CEFR-aligned vocabulary acquisition among university students.

Training Programs:

Provide training for educators on effective methods of integrating digital tools like e-books into their teaching practices.

By implementing these recommendations, future iterations of the e-book can be optimized to meet diverse learner needs while contributing to advancements in digital language education tools globally.

5.5 Summary

This chapter has summarized the results of the research, discussed the main findings with the other previous studies, concluded what have been found in the studies, and finally presented recommendations and suggestions for future research and studies.

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Appendices

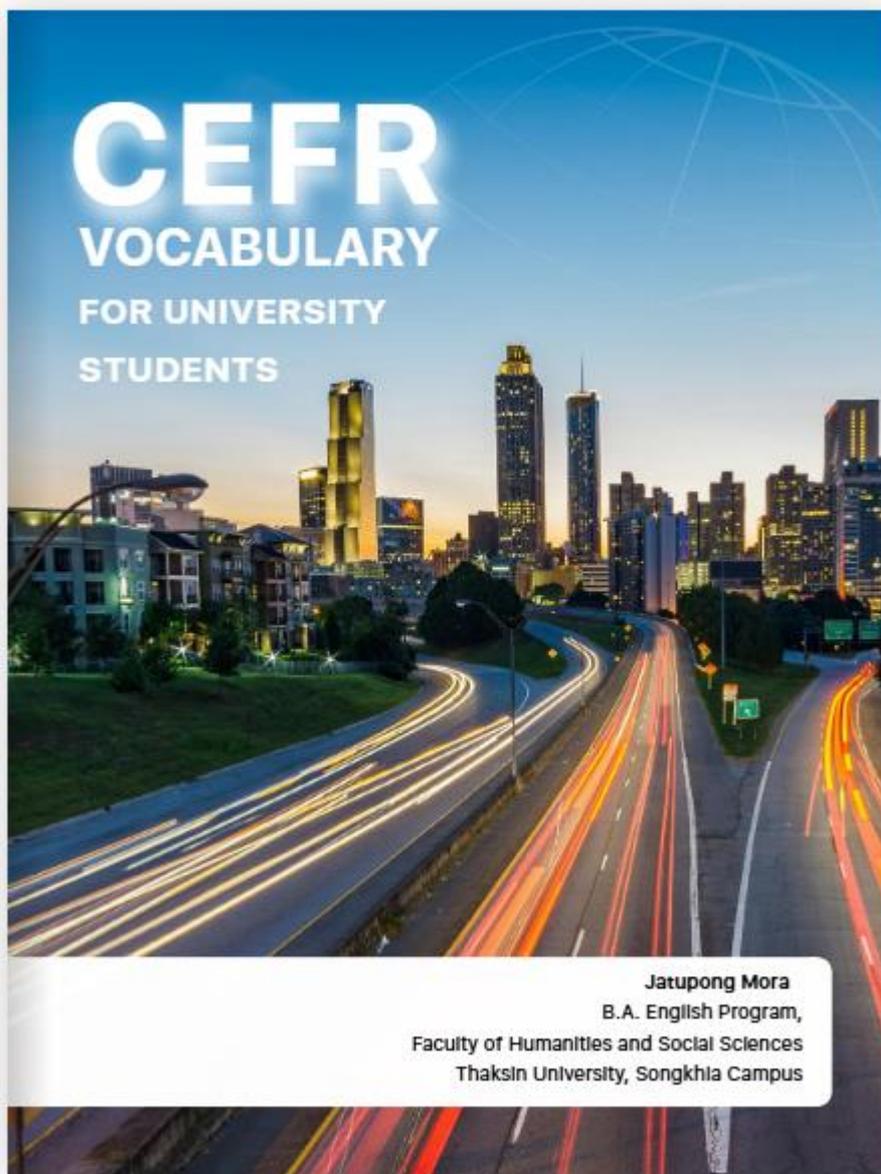
Appendix A: CEFR Vocabulary for University Students

Link: <https://heyzine.com/flip-book/77a53b4d90.html>

QR Code:



E-book Sample Pages



4 UNIT 1 CEFR A2 VOCABULARY
UNIT 1 CEFR A2 VOCABULARY 5

charity ▶

Part of Speech: Noun

Pronunciation

- English: /ˈtʃær.ə.ti/
- Thai: แช-ริ-ตี้

Thai Definition: การกุศล

Example Sentences

The firm donates a portion of its profits to **charity** every year.

- บริษัทบริจจาคำไรส่วนหนึ่งให้ทำกุศลทุกปี

They organized a **charity** event to support local businesses.

- พวกเขาจัดกิจกรรมการกุศลเพื่อสนับสนุนธุรกิจในท้องถิ่น

USAGE

Often used when referring to organizations or activities that support social causes, typically through donations.

condition ▶

Part of Speech: Noun

Pronunciation

- English: /kənˈdɪʃ.ən/
- Thai: คอน-ดิ-ชัน

Thai Definition: เงื่อนไข, สภาพ

Example Sentences

The contract includes several **conditions** for the project's approval.

- สัญญามีเงื่อนไขหลายประการเพื่อใช้สำหรับอนุมัติโครงการ

The working **conditions** in the factory need to be improved.

- สภาพการทำงานในโรงงานต้องได้รับการปรับปรุง

USAGE

Frequently used in business contracts or to describe terms or situations in a professional context.

[HOME](#) [CONTENTS](#) [A2](#) [B1](#) [B2](#) [C1](#) [END](#)

[HOME](#) [CONTENTS](#) [A2](#) [B1](#) [B2](#) [C1](#) [END](#)

Appendix B: Vocabulary Practice Exercises

TOEIC Vocabulary List

A2-TOEIC Vocabulary List

1. arrangement
2. celebrate
3. charity
4. condition
5. definitely
6. employ
7. feature
8. laptop
9. mention
10. organize
11. platform
12. predict
13. prevent
14. raise
15. recipe
16. remove
17. schedule
18. sightseeing
19. strategy
20. unfortunately

Sample of Vocabulary Exercise 1 (A2-01-10)

Choose the best answer.

1. We need to finalize the _____ for the meeting before Friday.

- a) condition
- b) charity
- c) arrangement
- d) laptop

Key: c) arrangement

2. The company plans to _____ its 50th anniversary with a large event.

- a) organize
- b) celebrate
- c) employ
- d) mention

Key: b) celebrate

3. Our organization donates a portion of its profits to _____ every year.

- a) charity
- b) condition
- c) feature
- d) arrangement

Key: a) charity

4. The contract is only valid under certain _____.

- a) laptops
- b) conditions
- c) arrangements
- d) mentions

Key: b) conditions

5. He is _____ the best candidate for the job, based on his experience.
- a) organize
 - b) feature
 - c) definitely
 - d) mention
- Key:** c) definitely
6. The company plans to _____ 100 new workers to meet the growing demand.
- a) mention
 - b) employ
 - c) celebrate
 - d) organize
- Key:** b) employ
7. One key _____ of the new smartphone is its long battery life.
- a) arrangement
 - b) charity
 - c) feature
 - d) condition
- Key:** c) feature
8. Most employees now use a _____ to work remotely.
- a) laptop
 - b) charity
 - c) condition
 - d) feature
- Key:** a) laptop
9. In your report, make sure to _____ all relevant points clearly.
- a) employ
 - b) celebrate
 - c) mention
 - d) condition
- Key:** c) mention

10. We need to _____ the conference, including booking the venue and preparing materials.

a) organize

b) feature

c) celebrate

d) laptop

Key: a) organize

Appendix C: Vocabulary Test

Sample Test Items

A2 15 ข้อ

Choose the best answer.

1. The event planner made all the necessary ___ for the company's annual conference.

- A) conditions
- B) mentions
- C) arrangements
- D) schedules

Key: C) arrangements

2. The employees will ___ their boss's 10th anniversary at the company with a special party.

- A) employ
- B) predict
- C) celebrate
- D) organize

Key: C) celebrate

3. The company donates a portion of its profits to ___ organizations every year.

- A) charity
- B) platform
- C) prevention
- D) recipe

Key: A) charity

4. Before signing the contract, make sure to carefully review each ___ stated in the agreement.

- A) recipe
- B) condition
- C) celebration
- D) arrangement

Key: B) condition

5. The project is progressing well, and we will ___ meet the deadline.

A) unfortunately

B) predictably

C) definitely

D) preventively

Key: C) definitely

6. The company plans to ___ 50 new workers to meet increased demand for its products.

A) employ

B) mention

C) prevent

D) remove

Key: A) employ

7. The latest model of the phone has several new ___, including a better camera and faster processor.

A) conditions

B) mentions

C) features

D) strategies

Key: C) features

8. The presentation will be easier to follow if you bring your ___ to take notes and access the slides.

A) arrangement

B) platform

C) laptop

D) recipe

Key: C) laptop

9. During the meeting, the manager failed to ___ the recent changes in company policy.

- A) mention
- B) raise
- C) celebrate
- D) organize

Key: A) mention

10. We need to ___ the event in advance to ensure everything runs smoothly.

- A) employ
- B) organize
- C) predict
- D) prevent

Key: B) organize

11. The company uses a digital ___ to communicate with remote employees and manage workflows.

- A) charity
- B) platform
- C) sightseeing
- D) schedule

Key: B) platform

12. It is difficult to ___ how the market will change over the next year due to unpredictable economic conditions.

- A) predict
- B) employ
- C) celebrate
- D) organize

Key: A) predict

13. To ___ errors in the report, it's important to double-check all calculations before submission.

- A) remove
- B) prevent
- C) celebrate
- D) employ

Key: B) prevent

14. The company plans to ___ prices next quarter to keep up with rising production costs.

- A) raise
- B) celebrate
- C) mention
- D) employ

Key: A) raise

15. The chef provided the ___ for the signature dish at the company's annual dinner event.

- A) strategy
- B) arrangement
- C) recipe
- D) condition

Key: C) recipe

Appendix D: Expert Evaluation Questionnaire: Assessment of the E-book

Part 1: Overall Quality of the E-book

The following questions are designed to evaluate the quality of the e-book. Please read each question carefully and indicate your rating by marking a tick (✓) under the corresponding number, as specified below:

- 5: Excellent
- 4: Good
- 3: Fair
- 2: Poor
- 1: Very poor

Evaluation Statements	Ratings				
	5	4	3	2	1
1. Content Quality					
1.1 Relevance of Content					
The appropriateness of the vocabulary used for the intended CEFR levels					
The relevance of the content to learners' needs					
1.2 Quality of Examples					
The accuracy of the example sentences in demonstrating the contextual usage of vocabulary					
1.3 Inclusivity					
The extent to which the content addresses diverse contexts and learner needs (e.g., academic, professional, general)					
1.4 Cultural and Linguistic Appropriateness					
The extent to which the examples and definitions respect cultural differences and use inclusive and appropriate language					

Evaluation Statements	Ratings				
	5	4	3	2	1
2. Design and Usability					
2.1 Navigation					
The ease of navigation in the e-book					
2.2 Visual Design					
The effectiveness of the e-book's layout and design in enhancing the learning experience					
3. Technical Accessibility					
The likelihood that learners will not encounter technical difficulties when using the e-book					
4. Learning Effectiveness					
4.1 Engagement					
The engagement level of the review exercises and activities provided					
4.2 Knowledge Retention					
The effectiveness of the exercises and examples in the e-book in promoting long-term vocabulary retention					
5. Pedagogical Alignment					
5.1 Learning Objectives					
The alignment of the e-book with established CEFR learning objectives for vocabulary acquisition					
5.2 Adaptability					
The adaptability of the e-book content for diverse learning contexts (e.g., individual study, classroom use)					
6. Overall Assessment					
6.1 Overall Quality					
The overall quality of the e-book					

Evaluation Statements	Ratings				
	5	4	3	2	1
6.2 Recommendation					
The recommendation of this e-book for learners at the target CEFR levels					

Please provide additional comments regarding each aspect of the quality evaluation.

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Part 2: Suggestions for Improvement

1. Overall Feedback

What specific changes or improvements would you recommend for the e-book's content, structure, or design? *(Please provide detailed feedback in the space below.)*

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2. Additional Features

Do you think any features or tools should be added to enhance the e-book? *(Yes/No; if yes, please provide details.)*

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Name

Date

Appendix E: E-book Users' Feedback Questionnaire

This questionnaire is designed to get users' feedback after their use of the e-book to get some information for the improvement of the e-book.

Part 1. User Profile

1) What is your current level of English proficiency?

- A1
 A2
 B1
 B2
 C1
 C2

2) What is your main purpose for using this e-book?

- test preparation
 language improvement
 academic needs
 other (please specify)

3) How often did you use the e-book?

- daily
 weekly
 only once
 other (please specify)

Part 2. Users' Satisfaction with the E-book

The following questions are designed to evaluate users' satisfaction with the e-book.

Please read each question carefully and indicate your satisfaction by marking a tick

(✓) under the corresponding number, as specified below:

- 5: Very Satisfied
- 4: Satisfied
- 3: Neutral
- 2: Dissatisfied
- 1: Very Dissatisfied

Evaluation Statements	Levels of Satisfaction				
	5	4	3	2	1
1. Content Quality					
1) To what extent were the vocabulary words relevant and useful for your learning needs, and how satisfied are you with them?					
2) How clear were the definitions provided for each word, and how satisfied are you with those definitions?					
3) Did the example sentences help you understand the context and usage of each word? How satisfied are you with these examples?					
2. Learning Experiences					
1) Did the e-book format make learning vocabulary easy and enjoyable, and how satisfied are you with this format?					
2) How engaging were the review exercises provided after every 10 words, and how satisfied are you with these exercises?					
3) Did the e-book help improve your confidence in using new vocabulary, and how satisfied are you with it?					
3. Design and Usability					
1) Was the e-book easy to navigate? How satisfied are you with it?					
2) How would you rate the visual layout of the e-book? How satisfied are you with it?					
3) Did you experience any technical difficulties while using the e-book? How satisfied are you with it?					

Evaluation Statements	Levels of Satisfaction				
	5	4	3	2	1
4. Learning Outcomes					
1) Do you feel that your vocabulary knowledge improved after using the e-book? How satisfied are you with the improvement?					
2) Were you able to recognize or use any of the new vocabulary in real-life situations after studying with the e-book? How satisfied are you with this progress?					
3) Would you recommend this e-book to other learners aiming to improve their vocabulary? How satisfied are you with your experience using it?					
5. Overall Satisfaction					
How satisfied are you with your overall experience using this e-book?					

Part 3: Suggestions for Improvement

1) What additional features or content would you like to see in future versions of this e-book?

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2. Do you have any specific suggestions to improve the e-book’s usability or content?

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3) Do you have any final comments or feedback regarding your experience?

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Thank you for your cooperation.

Appendix F: Expert-Specific Recommendations

Expert 1

1. Content Suggestions:

- Add diverse examples beyond business contexts (e.g., academic, documentary, communication scenarios).
- Translate example sentences into Thai for better understanding.

2. Design Feedback:

- Enhance visual appeal with engaging graphics and illustrations.

3. Additional Features:

- Include short passages containing related vocabulary.

4. Recommendation:

The e-book is highly recommended due to its appropriate vocabulary level, well-structured content, and practical exercises.

Expert 2

1. Content Suggestions:

- Incorporate Thai translations for better comprehension.

2. Design Feedback:

- Add interactive design elements like images or playful features to engage users further.

3. Additional Features:

- Provide space for users to add notes or additional information.

4. Recommendation:

The e-book is recommended with minor adjustments to improve user engagement and personalization features.

Expert 3

1. Content Suggestions:

- Include English definitions alongside Thai definitions for better clarity.
- Localize examples to reflect learners' cultural backgrounds (e.g., using familiar events or contexts).

2. Design Feedback:

- Ensure consistency in exercises by focusing on specific parts of speech.

3. Additional Features:

- Allow learners to rate exercises or provide comments on sections.
- Add journaling exercises for learners to create personalized sentences using new vocabulary.

4. Technical Accessibility:

Address compatibility issues with older devices and ensure offline functionality.

5. Recommendation:

The e-book is strongly recommended due to its alignment with CEFR objectives, practical vocabulary application, adaptability for diverse learning contexts, and comprehensive user-friendly design.

Summary Table of Key Insights

Aspect	Expert 1	Expert 2	Expert 3
Content Enhancements	Add diverse examples; Thai translations	Thai translations; more images	English definitions; localized examples
Design Improvements	Enhance visuals	Add playful features	Consistency in exercises
Additional Features	Short passages	Space for notes	Journaling; rating system
Technical Accessibility	N/A	N/A	Address compatibility issues
Recommendation	Highly recommended	Recommended	Strongly recommended