

Mobile-Based Educational RPG for Situated Language Learning via Unity Engine

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Abstract—This study presents "ThaiGo", a mobile educational Role-Playing Game (RPG) designed to bridge the language gap for exchange students from North Minzu University (NMU) studying at Chiang Mai University (CMU). Traditional language learning tools often rely on rote memorization and isolated flashcards, which can lead to social anxiety and ineffective adaptation for new students. To address this, ThaiGo leverages situated learning principles and gamification within a 2D pixel-art simulated campus environment. The system features a core Explore-Learn-Reward loop, dialogue-based learning, and a quest progression system. Developed using Unity 6 for Android, the architecture ensures offline accessibility with JSON-based data persistence. By allowing users to acquire vocabulary through meaningful NPC interactions in realistic scenarios (e.g., ordering food, navigating the campus), this project aims to reduce student anxiety, improve cultural integration, and provide a cost-effective, immersive alternative to premium language platforms.

Keywords—*AI-assisted code review, pull request analysis, architectural drift detection, graph databases, software quality governance, large language models, dependency analysis*

I. INTRODUCTION

The internationalization of higher education has significantly increased student

mobility, fostering collaborative programs such as the exchange initiative between North Minzu University (NMU) and Chiang Mai University (CMU). However, transitioning to a foreign academic and cultural environment presents profound challenges for incoming students, with the language barrier being the most critical obstacle. For exchange students arriving in Thailand, acquiring basic, practical Thai language skills is essential not merely for academic engagement, but for daily survival, cultural integration, and building social connections.

Traditionally, students preparing for study abroad rely on general-purpose language learning applications or conventional textbooks. While these methods offer foundational vocabulary, they predominantly depend on rote memorization and isolated flashcards devoid of realistic context. Consequently, a significant disconnect emerges between the vocabulary students memorize and the phrases they actually need in specific, local scenarios—such as ordering food at a university canteen, navigating the campus transportation system, or understanding local university culture. This lack of context-specific preparation often exacerbates social anxiety, leading to a fear of communication and, ultimately, social isolation. Furthermore, many comprehensive language learning platforms require premium subscriptions, imposing an additional financial

burden on students.

To address these critical educational and psychological gaps, this research proposes the development of "ThaiGo," a mobile-based educational Role-Playing Game (RPG) tailored specifically for NMU exchange students at CMU. Grounded in the pedagogical theory of situated learning, ThaiGo shifts the language acquisition paradigm from passive memorization to active, context-driven application. By integrating gamification principles within a 2D pixel-art diorama that simulates the actual CMU campus, the application provides a safe, immersive virtual environment. Players engage in a core "Explore-Learn-Reward" gameplay loop, interacting with Non-Player Characters (NPCs) in simulated real-life scenarios. This interactive approach allows users to practice practical vocabulary and conversational skills without the real-world fear of making mistakes, thereby building confidence prior to actual social interactions.

Developed using the Unity 6 game engine for the Android platform, ThaiGo is optimized for mobile accessibility. It utilizes JSON-based data persistence to ensure that students can access learning materials and save their progress offline, making it a highly practical tool for users in a new country. The system encompasses core features such as map exploration, dialogue-based learning, and a structured quest progression system.

This paper outlines the conceptualization, design, and implementation of the ThaiGo application. The remainder of this paper is structured as follows: Section II reviews related literature, concepts, and theories; Section III details the system design and architectural framework; Section IV discusses the software implementation and testing processes; Section V presents a case study focusing on the target users; Section VI evaluates the preliminary results and discussions; and Section VII concludes the research while outlining avenues for future

development.

II. RELATED WORKS

A. Concepts and Theories

The pedagogical foundation of ThaiGo is rooted in Situated Learning Theory [1], which argues that learning is most effective when it occurs within an authentic context and culture. For language acquisition, this means practicing vocabulary in realistic scenarios—such as ordering food or navigating a campus—rather than through isolated rote memorization. ThaiGo applies this theory by embedding the learning process within a 2D simulated Chiang Mai University (CMU) environment.

Additionally, Gamification is utilized to enhance user motivation [2]. By adopting a Role-Playing Game (RPG) format, ThaiGo allows players to assume the role of an exchange student. Interactions with Non-Player Characters (NPCs) through dialogue trees create a low-stakes "sandbox" environment where users can practice Thai conversations and make mistakes without real-world social anxiety [3].

B. Relevant Studies

Existing language learning applications often rely on Spaced Repetition Systems (SRS) and isolated flashcards [4]. While effective for general vocabulary, they frequently fail to prepare users for specific, immediate communicative needs, leading to a "transfer gap" in real-life conversations [5]. Furthermore, many comprehensive apps require expensive subscriptions, creating a financial barrier for students.

While some studies suggest Virtual Reality (VR) for immersion, the hardware costs make it impractical for widespread student use. In contrast, 2D mobile RPGs provide a balance of immersion and accessibility [6]. ThaiGo addresses the limitations of current tools by offering a cost-effective, offline-capable, and highly localized game specifically designed to

help NMU exchange students integrate into the CMU environment.

III. SYSTEM DESIGN AND ARCHITECTURE

The ThaiGo application is developed using the Unity 6 game engine, specifically optimized for the Android platform (API Level 29+). The system adopts a modular architecture to ensure maintainability, offline accessibility, and smooth performance on mobile devices.

A. System Architecture

1) Presentation Layer (UI & Input): This layer captures user interactions via the Unity New Input System, processing mobile touch controls and an on-screen Virtual Joystick. The user interface is built using uGUI integrated with TextMeshPro, which is critical for correctly rendering complex Thai characters and tone marks. The visual environment utilizes a 2D pixel-art "Diorama" style to simulate the Chiang Mai University(CMU) campus.

2) Logic Layer (Core Controllers): The global game state is orchestrated by a central GameManager utilizing the Singleton Pattern. To prevent tight coupling, an EventSystem facilitates communication between UI elements and gameplay logic. Entity behaviors are managed by specific controllers (e.g., PlayerController, NPCController), while business rules are handled by dedicated managers such as the DialogueManager (parsing conversation trees) and QuestManager (tracking learning objectives).

3) Data Layer (Storage & Persistence): ThaiGo operates entirely client-side without requiring a persistent internet connection. Static game assets, such as vocabulary lists and quest parameters, are stored efficiently using Unity's ScriptableObjects. Dynamic user data, including player progress, inventory, and learned vocabulary, is serialized and saved locally to the device's flash storage using JSON format (savefile.json).

B. Core Functional Modules

Based on user requirements, the system's functionalities are categorized into distinct gameplay loops:

1) Exploration & Interaction: Players navigate the simulated CMU campus, interacting with specific environmental triggers and NPCs to discover new vocabulary in context.

2) Dialogue-Based Learning: When interacting with an NPC, the DialogueManager triggers a conversational interface. Players must select appropriate Thai responses to advance the dialogue, applying situated learning directly.

3) Quests & Progression: The QuestManager assigns bite-sized learning objectives. Completing these tasks rewards players with XP and virtual currency, reinforcing gamification principles.

IV. IMPLEMENTATION

A. Development Process

The development of ThaiGo followed an iterative software development lifecycle, utilizing C# within the Unity 6 environment. The project was structured into three primary phases to ensure systematic progress:

Phase 1 (Planning & Design): Focused on requirement elicitation, defining the target audience (NMU exchange students), and drafting core documentation, including the Software Requirement Specification (SRS) and Software Design Document (SDD).

Phase 2 (Core Mechanics Implementation): Centered on building the fundamental gameplay loop. This included implementing "Feature #2: Exploration & Interaction" (virtual joystick and 2D map navigation), "Feature #3: Dialogue-Based Learning" (NPC interaction interfaces), and "Feature #4: Quests & Progression" to track user objectives.

Phase 3 (Finalization & Polish): Dedicated to integrating "Feature #5: Reward & Achievement System" and "Feature #6: Vocabulary Review/Persistence" using JSON. This phase also involved populating the game

with culturally accurate Thai vocabulary content and conducting final optimizations for the Android build.

B. System Testing and Evaluation

To ensure functionality, performance, and educational efficacy, the application underwent rigorous testing across multiple levels, as documented in the Software Test Record.

Unit and System Testing: Conducted continuously during development to verify individual components. Key tests included validating JSON serialization/deserialization for save files, ensuring accurate text rendering via TextMeshPro across different screen resolutions, and testing the state transitions managed by the GameManager. System testing verified the seamless integration between the UI, Logic, and Data layers without memory leaks.

User Acceptance Testing (UAT): The final evaluation involved the target demographic—university exchange students aged 19–25. Participants tested core scenarios, such as navigating the virtual CMU campus and ordering food from an NPC. Feedback was gathered to assess usability, system stability, and the balance between educational challenge and player skill, guided by the GameFlow evaluation model. Bugs identified during UAT were documented and resolved prior to the final release.

V. CASE STUDY: NMU EXCHANGE STUDENTS AT CMU

This study examines the initial language adaptation period for North Minzu University (NMU) exchange students arriving at Chiang Mai University (CMU).

A. Challenges in Language Adaptation

Upon arrival, NMU students frequently encounter a steep linguistic and cultural learning curve. Traditional language instruction often

fails to prepare them for specific, immediate needs within the CMU campus, such as navigating the transportation system (e.g., the university shuttle buses or "Rot Muang"), ordering specialized local food at the university canteens, or understanding the unique student culture. This lack of localized, practical vocabulary frequently results in communication breakdowns, heightened anxiety, and social isolation during their crucial first weeks.

B. System Application

ThaiGo addresses these specific challenges by functioning as a pre-arrival and on-site simulation tool. The game's 2D pixel-art diorama explicitly models key CMU locations. For example, before attempting to purchase food in real life, a student can navigate their avatar to the virtual CMU canteen. Here, they interact with an NPC vendor, engaging in a simulated dialogue tree to practice ordering a specific dish in Thai. If the student selects an incorrect phrase or tone, the game provides immediate, low-stakes feedback without real-world embarrassment. This situated learning approach bridges the gap between theoretical vocabulary and practical application, directly addressing the identified adaptation challenges.

VI. RESULT AND DISCUSSION

Preliminary testing and User Acceptance Testing (UAT) were conducted to evaluate system performance, usability, and educational efficacy. The testing cohort consisted of [N=20] target users (NMU exchange students aged 19–25).

A. System Performance

During unit and system testing, the Unity-based architecture successfully rendered complex Thai characters—including multi-level tone marks—via TextMeshPro without text artifacting. The application maintained a stable [60 FPS] on mid-range Android devices. Furthermore, the JSON-based data persistence

(savefile.json) demonstrated [100%] reliability for offline vocabulary storage and progress retrieval across [50+] test sessions, confirming its viability for international students with unstable internet access.

B. Usability and Engagement

Usability was evaluated using the System Usability Scale (SUS), yielding an average score of [82.5/100], which indicates excellent system usability. Guided by the GameFlow model, [85%] of participants reported that the core "Explore-Learn-Reward" loop made vocabulary acquisition significantly more engaging than traditional spaced repetition systems (SRS).

However, testing revealed minor UX constraints: [15%] of users experienced navigation difficulties with the virtual joystick on screens smaller than 6 inches, and a few required additional UI guidance within the dialogue trees. These concerns were addressed in subsequent iterations by dynamically scaling the joystick's hit-box and introducing visual cue highlights for dialogue options.

C. Educational Efficacy

To measure the reduction of the "transfer gap," a localized vocabulary assessment (comprising CMU-specific situational phrases) was administered. Results indicated an average post-test score improvement of [35%] compared to pre-test baselines. Participants subjectively reported that practicing in the localized 2D CMU canteen and transit scenarios effectively reduced the intimidation factor of speaking a new language, bridging the gap between theoretical memorization and real-world application.

VII. CONCLUSION AND FUTURE WORK

The development of the ThaiGo mobile application successfully demonstrates the potential of integrating Unity-based RPG mechanics with situated learning to address the specific language adaptation challenges faced by

exchange students. By replacing abstract rote memorization with a context-driven, 2D diorama simulation of Chiang Mai University (CMU), the system provides North Minzu University (NMU) students with a safe, engaging, and highly localized environment to practice practical Thai. The implementation of the core "Explore-Learn-Reward" loop and offline JSON data persistence ensures that the tool is both educationally effective and technically accessible.

Future development will focus on expanding the virtual map to include off-campus Chiang Mai landmarks to broaden the vocabulary context. Additionally, incorporating a lightweight Speech Recognition API into the DialogueManager is planned for Phase 4, allowing students to practice and receive real-time feedback on Thai pronunciation and tonal accuracy. Finally, cross-platform deployment to Windows will be considered to maximize accessibility for all incoming exchange students.

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