

Interactive Computer Aided Learning Instruction in Filipino Subject
for Grade 1 Students of Central Philippine University

A Capstone Project

Presented to

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CHAPTER I

INTRODUCTION

Overview of the Current State

As time progresses, the education system faces the challenges of infusing creativity into the integration of diverse learning tools aimed at fostering and enhancing a child's learning abilities. The 1st-grade level teachers at Central Philippine University Elementary are familiar with the challenge of motivating and capturing a child's attention while imparting lessons through hands-on learning.

The Central Philippine University Elementary department employs a variety of tools, including Schoology, E-books, textbooks, and traditional pen-and-paper methods, to deliver their curriculum. However, as time progresses, there is a growing challenge in maintaining students' motivation to engage with the Filipino language and subject matter. Enhancing strategies to spark students' interest in both the materials and the language itself has become increasingly essential.

Recent research underscores the pivotal role of listening and speaking skills in fostering proficient and self-assured readers among learners. Their findings indicate a positive correlation between enhanced listening and speaking abilities and the subsequent improvement in vocabulary acquisition during writing tasks. Moreover, the absence of adequate auditory resources for learning new words and phrases can detrimentally impact a child's educational development, potentially hindering their comprehension and retention of vocabulary for future applications. Such insights underscore the significance of addressing auditory resources as a crucial component of effective language instruction and literacy development strategies (Jacobs et al., 2016).

Recent research has recognized the intrinsic competitive nature of children (Cheong et al., 2014), indicating that incorporating gamification into learning activities holds promise for boosting engagement and academic performance. This approach capitalizes on students' natural inclination towards competition, potentially fostering more effective learning outcomes. By melding game elements with educational content, educators have the opportunity to tap into students' motivational drivers. Through a thorough examination of existing literature and empirical analysis, this study contributes valuable insights to the discourse on optimal pedagogical methodologies. Despite the availability of visual aids in current teaching strategies, such as e-books, these resources often fall short in capturing students' interest and motivation, particularly in subjects presented in languages other than their primary one.

The education system nowadays, students are encountering increasing challenges in adapting to traditional pedagogical methods, such as pen-and-paper learning. To address these difficulties, Computer-Aided Instruction (CAI) has been developed as a pivotal component of technology-assisted teaching. Distinguished from online or networked learning, Computer-Aided Instruction (CAI) operates locally on the machine, offering a tailored educational experience. Its widespread adoption in the education sector underscores its potential to support teachers, students, and parents, particularly amidst the disruptions caused by the Coronavirus disease (COVID-19) pandemic. With schools closed and learning transitioning to home environments, educators and caregivers are tasked with facilitating remote education. This shift has significantly reshaped the educational landscape in various countries, highlighting the importance of leveraging Computer-Aided Instruction (CAI) to navigate these unprecedented challenges. (S Nurlaili and D R Sari 2020)

As society gradually returns to pre-pandemic routines, the indispensable role of smartphones and smart devices in daily life has become increasingly apparent. These devices are integral to various aspects of modern living, including communication, shopping, food delivery, and entertainment. Given their ubiquitous presence, understanding and

harnessing the potential of smartphones has become a significant consideration in contemporary educational contexts. While smartphones were once viewed primarily as distractions from learning, recent studies, such as those by Tashfeen Ahmad (2020), suggest a paradigm shift, demonstrating their potential to serve as effective learning tools. This evolving perspective underscores the importance of investigating the educational implications of smartphone integration in academic settings.

Acknowledging achievements through rewards fosters a sense of accomplishment, particularly in the context of education where young learners are often motivated by incentives. Implementing a rewards system can significantly enhance students' engagement and motivation in their academic pursuits. Games, renowned for their compelling nature, inherently tap into individuals' intrinsic motivation, often prompting participation purely for enjoyment and the opportunity to succeed (Dicheva et al., 2015). Thus, understanding the impact of rewards and gamification on student motivation is crucial in shaping effective educational practices.

Desired State of Technology

This study aims to develop a portable application using Flutter and Firebase as the main foundation of the platform, intended to captivate children in learning activities. It will employ storyboards, drag-and-drop exercises, images, and audio-visual translations, providing flexibility for home-based learning. Moreover, the application will facilitate real-time monitoring of students' progress by teachers. Furthermore, the mobile app will integrate a rewards-based system utilizing stars, which can be used on a separate interface for customizing their character's attire through drag-and-drop functionality. This feature aims to enhance learner motivation and engagement with the application's future activities.

Statement of the Problem

The following are the problems that the researchers have identified:

1. Difficulty of achieving proper student engagement and participation in the learning process due to the usage of traditional teaching methods, such as textbooks and e-books.
2. The lack of direct translations of words from the English language to the Filipino language creates a language barrier and comprehension difficulties, limiting student participation.
3. Limited exposure to Filipino vocabulary outside the learning environment affects the student's language acquisition.
4. Teachers encounter challenges in efficiently monitoring their students' learning progress inside or outside the classroom setting.

General Objectives

To develop an interactive computer-aided instruction (CAI) application to enhance early childhood education designs specifically for Grade 1 students in the Filipino subject.

Specific Objectives

To achieve the aim of this study, we have the following specific objectives:

1. To develop an interactive module for interactive activities such as games and storytelling in Filipino language subject.
2. To develop a translation module dedicated to translating words or terminologies from English to Filipino through educational videos and recordings.
3. To develop a vocabulary module dedicated to introduce new Filipino words every start of new educational module towards achieving successful language acquisition

4. To develop a real-time tracking system with a star based reward system that motivates young learners with successful monitoring.

Theoretical Framework of the Study

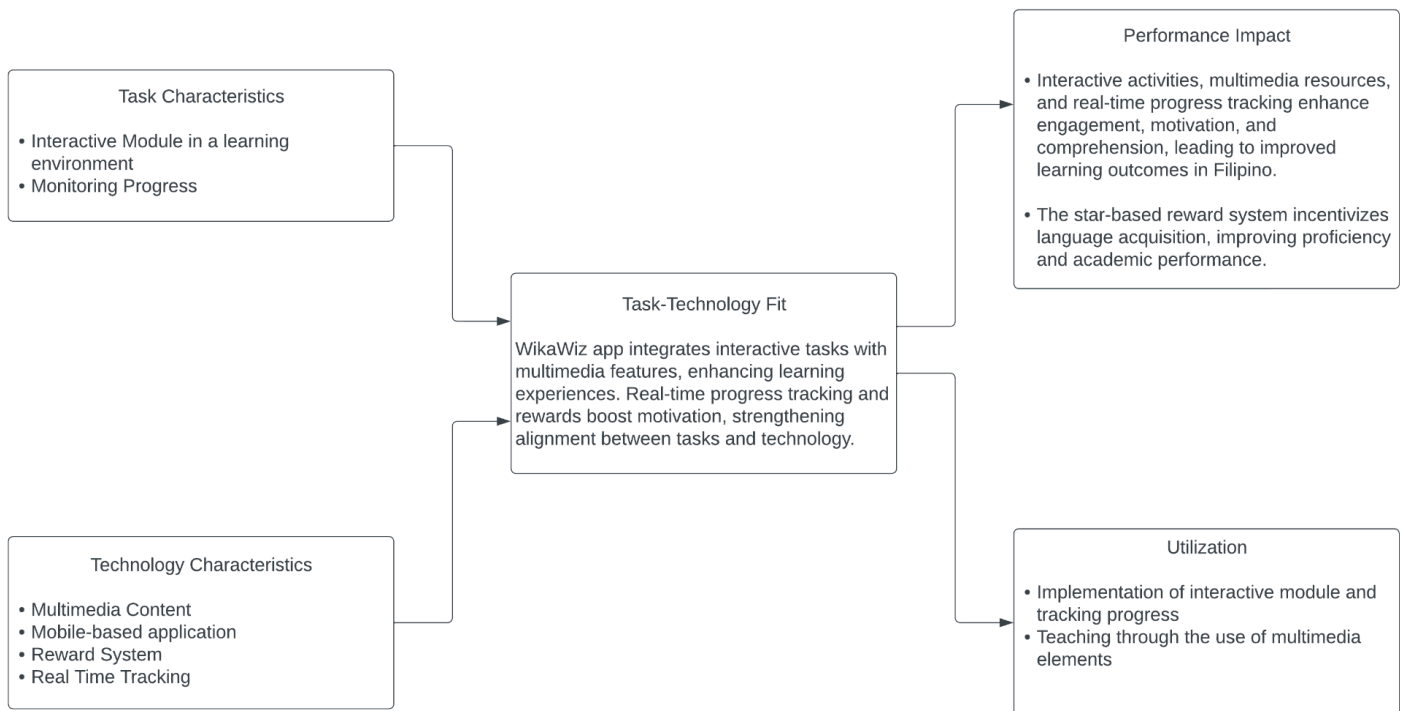


Figure 1. Theoretical Framework of the Study

E-Learning represents a significant departure from traditional learning methods, particularly evident in the Philippines, where individuals previously pursued degrees from foreign correspondence institutions independently. Initially met with skepticism, the introduction of computers in educational settings was feared to diminish the interpersonal aspect vital for some learners. However, technological advancements, including the integration of smartphones, tablets, and interactive instructional designs, have transformed distance learning into a dynamic educational medium. Students once used transmissive learning methods, but curricula are now shifting from being content-centered to competency-based, encouraging students to take charge of their education (Oliver, 2002). Assisted by visual aids like television, video, computers, and the internet, contemporary students are undergoing

development. The conventional Traditional Instruction (TI) approach lacks efficacy in capturing the attention of these students, given that many acquire information through visual media platforms integrated into daily life. Advancements in technology have created a substantial disparity between the methods through which society and educational institutions disseminate knowledge (London, 2005).

Moreover, the utilization of computers enhances student engagement and facilitates the delivery and storage of educational content. Rapid advancements in computer technology are fundamentally transforming the methods through which educators interact with their students (Hammoud et al., 2006). Computer-Assisted Instruction (CAI) materials have demonstrated a significant impact on individuals' learning processes. Studies indicate that appropriately designed Computer-Assisted Instruction (CAI) enhances students' academic performance, particularly in learning the English language and literature, while also bolstering their motivation and interest (Layugan, 2005). Parkinson and Thomas (2000) emphasize the role of literature as a model for proficient writing, known for its memorable, intellectually stimulating, and challenging nature, aiding in the assimilation of linguistic rhythms, and facilitating cognitive and emotional development.

Additionally, Computer-Assisted Instruction (CAI) has been acknowledged for its ability to enhance the educational environment (Chang, Sung, & Lin, 2006). This instructional approach offers students increased exposure to language through audio and visual presentations, enriching their learning experiences. Furthermore, Computer-Assisted Instruction (CAI) affords students the opportunity to visually engage with story scenes through video clips, providing a comprehensive understanding of the narrative in a multimedia format.

Conceptual Framework of the Study

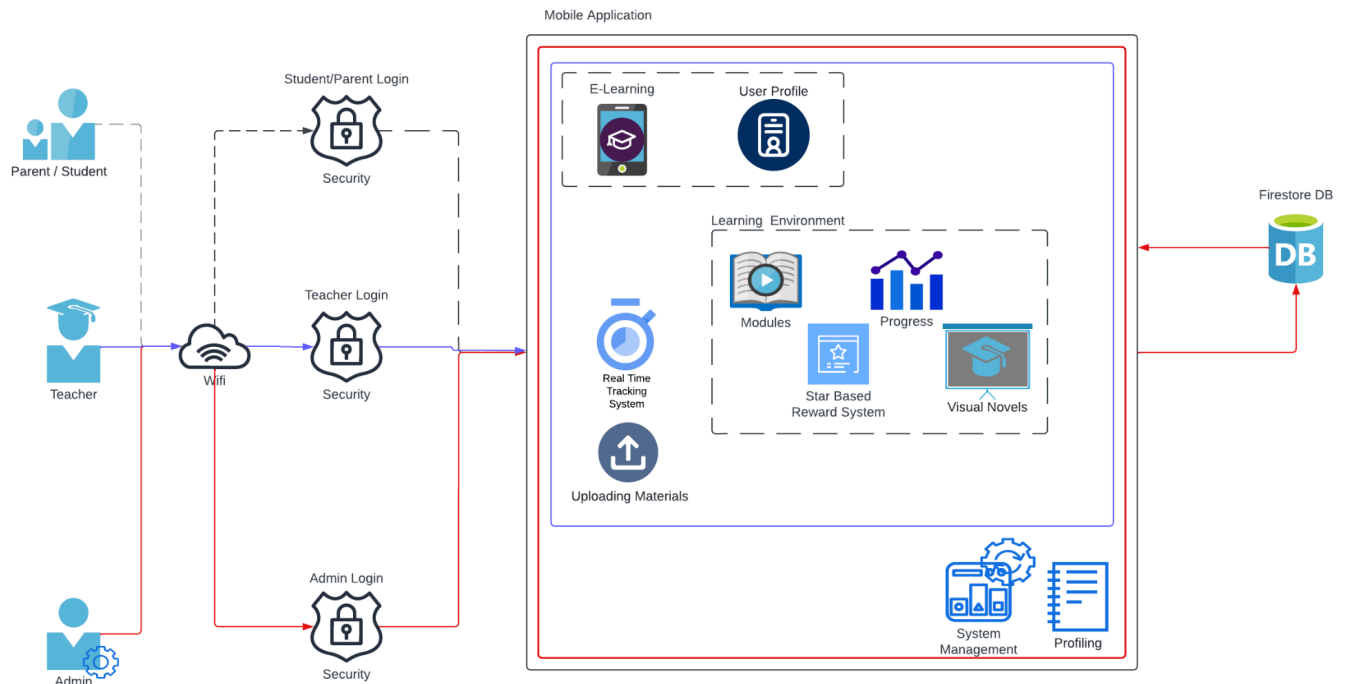


Figure 2. Conceptual Framework of Study

Security

This framework prioritizes user-centered design principles, incorporating security features such as parental controls, content filtering, and secure login procedures to safeguard student data and privacy while promoting a secure learning environment. Security measures are implemented through a standard login process in the application, mirroring common practices seen in various applications and websites. To access the system, users are required to provide credentials such as a password and email, granting them specific privileges and access to the modules.

Wireless Fidelity (WiFi)

WiFi or mobile data is necessary for the application to establish a connection with the user's location and access its content, as well as to maintain online connectivity with our server and administrators. This inclusion acknowledges the importance of WiFi in facilitating access to instructional materials, enabling users to engage with the Computer-Assisted Instruction (CAI) platform via devices such as

tablets, smartphones, and computers without the constraints of physical network cables. By leveraging WiFi technology, the Computer-Assisted Instruction (CAI) aims to provide seamless and flexible access to educational content, enhancing learning opportunities for Grade 1 students in various environments.

Mobile Application

WizKids is a mobile application platform that incorporates the use of a mobile application as the primary platform for delivering instructional content and offers flexibility, allowing students to access instructional materials anytime, anywhere, using their smartphones or tablets. By leveraging mobile technology, the Computer-Assisted Instruction (CAI) aims to provide a seamless and interactive learning experience tailored to the needs and preferences of Grade 1 learners, fostering greater participation and retention.

E-Learning

E-learning refers to the method of acquiring knowledge and skills through digital resources, accessible via electronic devices like computers, smartphones, tablets, or any internet-enabled device.

WizKids acknowledges the pivotal role of e-learning in modern education, emphasizing its capacity to transcend traditional classroom boundaries and provide flexible, accessible learning opportunities. By incorporating e-learning principles and technologies, the Computer-Assisted Instruction (CAI) endeavors to enhance the learning experiences of Grade 1 students, fostering engagement, interactivity, and personalized learning pathways. Through the integration of e-learning methodologies, the Computer-Assisted Instruction (CAI) aims to empower educators and learners alike, facilitating the attainment of educational objectives in the Filipino context.

Profiling

Profiling is the process of gathering and analyzing user data to create personalized learning experiences. Implementing profiling techniques, such as assessing students' learning preferences, progress, and areas of difficulty, developers can customize the Computer-Assisted Instruction (CAI) to meet the individual needs of Grade 1 learners. This inclusion emphasizes the importance of adaptive and learner-centric approaches in Computer-Assisted Instruction (CAI) design, aiming to enhance engagement, retention, and educational outcomes for Grade 1 students in the Filipino Subject.

Learning Environment

The learning environment encompasses the area where users engage with the learning materials provided by the application, housing all other modules such as quizzes, lessons, storytelling, and progress tracking.

WizKids highlights the importance of creating an engaging and conducive learning atmosphere for Grade 1 students, leveraging interactive technologies to enhance their learning experiences. By focusing on the learning environment, the Computer-Assisted Instruction (CAI) aims to foster collaboration, creativity, and critical thinking skills among students, to enrich the educational experiences of Grade 1 students within the Filipino educational framework.

Modules

Modules consist of educational materials organized into various sets of lessons.

WizKids emphasizes the structured organization of the Computer-Assisted Instruction (CAI), encompassing various interactive elements such as lessons, quizzes, storytelling segments, and progress tracking features. By focusing on modules, the framework aims to ensure a comprehensive and systematic delivery of

educational content, thereby enhancing learning experiences for Grade 1 students in their Filipino Subject.

Progress

Progress tracking involves monitoring user development across activities and documenting recent activity scores. The purpose of the progress module is to store users' recent scores, allowing them to review past results and identify areas where they may need further understanding.

Star-based Reward System

Star-based reward system is a method of incentivizing behavior or achievement by awarding stars or star-shaped tokens as a form of recognition or reinforcement. In educational contexts, it is often used to motivate students to engage in desired behaviors, such as completing assignments, participating in class discussions, or demonstrating positive behavior.

Integration of a reward system aims to enhance learner motivation and retention, fostering a positive learning experience for Grade 1 students in the Filipino subject.

System Management

System management involves overseeing, maintaining, or enhancing specific aspects of the application's systems to accommodate changing requirements.

System management entails overseeing hardware components, software applications, networks, databases, and other resources to align with the organization's goals. The goal is to optimize productivity, availability, and security while reducing downtime, errors, and inefficiencies. It involves proactive actions like preventive maintenance and performance tuning, as well as reactive measures such

as troubleshooting and problem resolution, to maintain system health and effectiveness.

Firestore DB

Firestore Database, offered by Firebase and Google Cloud, serves as a flexible and scalable database solution for mobile, web, and server development. Like Firebase Realtime Database, it maintains data synchronization across client applications via real-time listeners and extends offline support for both mobile and web platforms. The application employs Firestore DB as its primary database.

Visual Novel

The concept explored in the study involves blending narrative storytelling with educational content through the medium of visual novels. This innovative method aims to transform the learning process into an engaging experience that goes beyond the traditional routine of asking and answering questions. By employing visual novels as an alternative approach, learners can apply their acquired knowledge within simulated conversational scenarios to determine the most appropriate course of action.

Flutter

Flutter is an open-source UI software development kit (SDK) created by Google, used for building natively compiled applications for mobile, web, and desktop platforms from a single codebase. It allows developers to write code once and deploy it across multiple platforms, enabling faster development and easier maintenance. Flutter utilizes the Dart programming language and provides a rich set of pre-built widgets and tools for creating visually appealing and high-performance user interfaces.

User Profile

User Profile signifies the collection of information about individual learners. User profiles encompass various data points such as learning preferences, progress, and areas of difficulty. By utilizing user profiles, developers can tailor the Computer-Assisted Instruction (CAI) to meet the specific needs of Grade 1 students, providing personalized learning experiences. This inclusion underscores the importance of adaptive and learner-centric approaches in Computer-Assisted Instruction (CAI) development, aiming to enhance engagement, retention, and educational outcomes in the Filipino Subject

Scope and Limitations

This research focuses on the development and implementation of a mobile-based educational system tailored specifically for grade 1 students enrolled at Central Philippine University. The primary aim is to enhance the students' proficiency in the Filipino subject through engaging and interactive learning methods. The system offers an online interface with multimedia components such as videos, quizzes, recordings, educational games, and storytelling activities. It provides bilingual instruction in English and Tagalog to cater to students' language preferences, aligning with the objective of translating English to Filipino. Additionally, the platform enables real-time progress tracking of grade 1 students' proficiency in Filipino and incorporates a star-based reward system to motivate language acquisition. Parents will be responsible for creating accounts on behalf of their grade 1 children to access the system.

This research is limited to grade 1 students at Central Philippine University and may not be generalizable to other educational contexts or grade levels. The effectiveness of the educational system in enhancing the Filipino language proficiency will be evaluated based on subjective assessments and may not

capture all aspects of language learning. The scope of the system's features, such as the online interface and multimedia components, may be subject to technical limitations and constraints. Additionally, the involvement of parents in creating user accounts on behalf of grade 1 students may present logistical challenges and may require additional support or resources.

Significance of the Study

Students. This system offers Grade 1 students at Central Philippine University a more engaging and interactive approach to learning the Filipino language through Interactive Computer-Aided Learning Instruction. By incorporating game elements and interactive activities, students can enjoy learning while improving their language skills, boosting their confidence in using Filipino, and ultimately enhancing their academic performance and language proficiency.

Parents. This study offers Grade 1 learners' parents a means to track their children's progress and engagement in learning. It holds the potential to facilitate easier parental involvement by providing accessibility at home, fostering opportunities for shared learning experiences without exhausting their energy or posing difficulties in assisting their children.

Teachers. This study provides Grade 1 teachers with valuable insights into effective teaching strategies for Filipino language instruction. Teachers may learn how to incorporate technology and interactive elements into their lessons and create a more dynamic classroom environment that encourages better student engagement by investigating the effectiveness of Interactive Computer-Aided Learning. Furthermore, by being aware of the advantages of interactive computer-aided learning, educators can better meet the varied learning needs of their students and further their professional growth.

Admins. This study aims to provide administrators with valuable insights to enhance and accelerate the learning of Grade 1 students, particularly in the Filipino subject. By analyzing the academic performance data and percentile distribution, administrators can tailor interventions and support strategies to address areas of improvement effectively. Ultimately, this research endeavors to facilitate the achievement of better learning outcomes in Filipino, contributing to the overall educational advancement of our students.

CHAPTER II

REVIEW OF LITERATURE AND STUDIES

**E-LEARNING FILIPINO LANGUAGE: APLIKASYON PARA SA UNA AT PANGALAWANG
BAITANG (BrightFil)**

The application incorporates a diverse array of interactive and engaging activities tailored to meet the specific learning needs of young students. It offers a comprehensive range of features, including visual aids, auditory prompts, and interactive assessments, all strategically designed to support students in enhancing their reading, writing, speaking, and listening skills in the Filipino language. This feature set serves to foster students' ongoing motivation and commitment to learning and practicing the Filipino language. In summary, our e-learning application for Grade 1 and 2 students presents a dynamic and effective approach to language acquisition. By leveraging cutting-edge technology and innovative pedagogical strategies, we anticipate that our application has the potential to significantly impact the delivery of Filipino language education to young learners, providing them with a firm foundation in their native language for future academic endeavors. (Blanco, B. L. D., Laranja, P. G., Lipa, M. A. C., & Minguéz, J. Z., 2022)

Using Design Science Research to Incorporate Gamification into Learning Activities

In this study, the researchers explore the effectiveness of gamifying learning activities to enhance student engagement and learning outcomes. They acknowledge the challenges inherent in incorporating game elements into educational contexts, requiring a balanced integration of science, art, and experience. Leveraging the framework of design science research, the researchers aim to develop a non-discipline-specific instantiation of gamified learning to motivate students and improve learning quality. Their approach involves iterative refinement of a gamified multiple-choice quiz software tool. After trialing the tool in three undergraduate IT-related courses, the researchers evaluate its effectiveness through a questionnaire survey. Results reveal positive reception among students, with 76% expressing belief in its efficacy for learning and a desire for its integration into other courses. (<https://web.archive.org>)

Development of E-Learning Applications Using Web-Based Tools to Improve Learning Effectiveness (Case Study: STT Mandala Bandung)

The e-learning system, heralded for its myriad benefits and garnering attention from various sectors, particularly academia, has ushered in new opportunities in education. It represents an alternative aligned with contemporary pedagogical approaches in mass communication, facilitating online delivery of information, communication, education, and training. Importantly, e-learning complements rather than supplants traditional classroom learning, serving to reinforce educational models through technological advancements. The research involved direct observation to analyze the system's requirements, supplemented by a literature review to inform the development of e-learning applications. Implemented using PHP programming language and MySQL database, the e-learning system offers features such as material downloads, assignments, quizzes, and uploads. (Lestari, N., H., S., Rahman, T., Wirjawan, A., & Hidayat, R., 2019)

Using Mobile Apps to Facilitate English Learning for College Students in China by Qiaochu Liu and Xuan He

With the widespread adoption of mobile technology and the proliferation of applications, Chinese college students have the opportunity to enhance their English proficiency through mobile apps. Despite the enthusiasm surrounding the use of apps for learning, which offer multimedia features, portability, connectivity, and flexibility, there is a lack of research evidence regarding their efficacy in facilitating English language acquisition among college students, as well as their attitudes towards this novel approach. Additionally, there is a dearth of research identifying suitable apps for specific aspects of English studies, such as spoken English, reading comprehension, listening, or writing. To address these gaps, our study utilized a semi-structured interview survey and an experiment. The interviews involved five college students from USST or SDTU in China, who shared their perspectives on using apps for self-directed study. The experiment, conducted with 15 exchange students currently enrolled at the University of Borås, investigated the effectiveness of mobile devices in aiding English language learning. Results indicate that this approach is beneficial for college students to improve their English proficiency and that

undergraduates are receptive to using apps for self-regulated learning. Furthermore, we identify several apps suitable for college students and offer instructional strategies based on our findings to support independent English language learning. (Liu, Q., He, X., 2015)

DUOLINGO: A MOBILE APPLICATION TO ASSIST SECOND LANGUAGE LEARNING

Duolingo, a gamified language learning platform accessible online and through its app, offers a dynamic approach to learning various languages suitable for students of all ages and proficiency levels. With its adaptive algorithms, Duolingo tailors lessons to address individual learning needs effectively. Available both on the website and as a downloadable app, Duolingo provides students with convenient access to language learning resources, fostering a sense of ownership through customizable game avatars. Moreover, Duolingo offers teacher-level controls to align learning goals with specific linguistic objectives, such as vocabulary acquisition, grammar proficiency, or skill development. Additional features, including Duolingo for Schools, offer enhanced functionalities for educators, while ad-free experiences and offline courses are available with premium subscriptions. (Edwards, Luke 2023)

MEMRISE

Memrise, created by Ed Cooke and Greg Detre, stands out as an online learning tool dedicated specifically to vocabulary development. Tailored for individuals interested in expanding their vocabulary, Memrise appeals to both educators looking to support their students' linguistic growth and learners seeking an engaging approach to vocabulary enhancement. With its intuitive interface and incorporation of flashcard repetition to reinforce learning and memory retention, Memrise offers a user-friendly and effective platform for vocabulary improvement. Accessible via its website or downloadable mobile app from platforms such as the Play Store or App Store, Memrise provides users with convenience and practicality in their learning endeavors. (Aminatun & Oktaviani, 2019)

Summary

The BrightFil e-learning application offers interactive activities for Grade 1 and 2 students to enhance their proficiency in the Filipino language, utilizing features like visual aids and interactive assessments. It aims to revolutionize language acquisition by leveraging innovative pedagogical strategies.

The QuickQuiz study explores gamification in learning activities, aiming to enhance student engagement and outcomes. Through a questionnaire survey, positive reception among students highlights the tool's potential for integration into various courses.

The STT Mandala Bandung Case Study discusses the development of e-learning applications using web-based tools, enhancing learning effectiveness and flexibility through ubiquitous access to educational resources.

The Mobile Apps for English Learning study examines the impact of mobile apps on English language proficiency among college students in China, revealing positive attitudes towards app-based self-directed study.

Memrise, designed for vocabulary development, utilizes flashcard repetition to reinforce learning and memory retention, providing an engaging platform for educators and learners to enhance vocabulary skills conveniently.

Together, these studies showcase the diverse applications of e-learning tools in enriching language learning and educational effectiveness, offering valuable insights into technology-enhanced learning's potential to transform education globally.

While existing applications and websites provide valuable resources, our project, WizKidz, offers an enhanced and consolidated version tailored to student improvement and teacher accessibility for progress monitoring. Unlike traditional platforms, WizKidz prioritizes student motivation and immediate access to illustrative examples, fostering deeper

understanding and facilitating a positive learning experience. By focusing on sustained motivation and comprehensive learning support, WizKidz aims to maximize students' learning potential and promote creative educational engagement.

Table 1. Matrix of Studies and System

System Features	A	B	C	D	E	F
Login	✓	✓	✓	✓	✓	✓
Registration	✓	✓	✓	✓	✓	✓
Profiling	✓		✓	✓	✓	✓
Real-time Tracking System		✓	✓	✓	✓	✓
Rewards System						✓
Filipino-Catered Content	✓				✓	✓
Provided Modules	✓		✓	✓	✓	✓
Auditory Guide	✓			✓	✓	✓
Videographic Files	✓				✓	✓
Visual Novel	✓				✓	✓

Legend:

- A. BrightFil
- B. QuickQuiz
- C. Using Mobile Apps to Facilitate English Learning for College Students in China by Qiaochu Liu and Xuan He
- D. Duolingo
- E. Memerise
- F. Wizkidz

CHAPTER III

METHODOLOGY

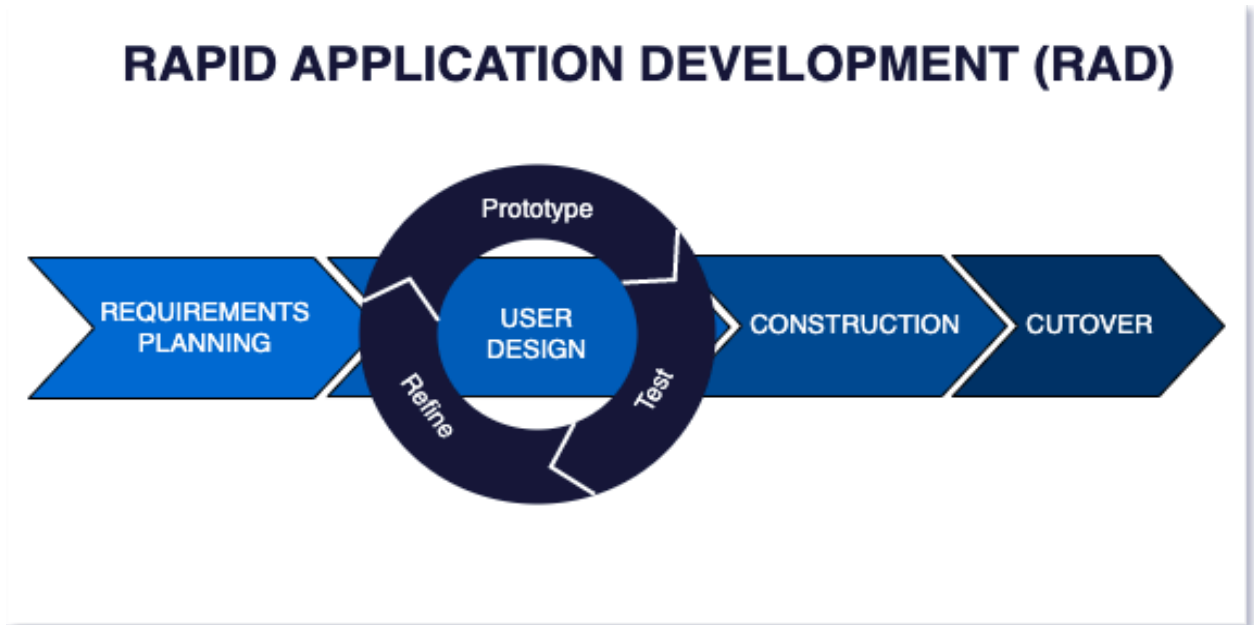


Figure 3. Rapid Application Development Methodology

RAD methodology emphasizes iterative development, user feedback, and rapid prototyping, making it suitable for designing interactive educational content. Effectively designed to adapt to changes and new inputs like features and functions, updates at every step of the development process.

Requirement Planning

This phase involves outlining a systematic approach for developing and deploying interactive computer-aided learning instruction in Filipino for Grade 1 students at Central Philippine University. It underscores the active involvement of participants, efficient resource allocation, effective timeline management, rigorous evaluation, sustainable practices, scalability, and alignment with institutional objectives. These elements are pivotal to ensuring the success and efficacy of the learning platform.

User Design

This phase involves the comprehensive design and mapping of interactive computer-aided instruction modules specifically tailored to meet Grade 1 curriculum standards. It encompasses structuring content hierarchically, categorizing multimedia assets, and defining data structures for interactive elements such as quizzes and games. Additionally, mechanisms for tracking and recording student progress and preferences are established, while a star-based reward system is integrated to incentivize engagement and progress. Emphasis is placed on ensuring adaptability for localization and seamless integration with learning management systems, with paramount attention given to data security and privacy.

Furthermore, this phase entails creating detailed storyboards to outline the structure of the modules and meticulously designing interactive activities. These activities include engaging features such as drag-and-drop exercises and hands-on tasks that integrate culturally relevant multimedia elements. Moreover, a visually appealing and child-friendly user interface is carefully crafted to enhance the learning experience. Implementation of a reward-based system to encourage ongoing student participation and progress is central, alongside an iterative prototyping approach that incorporates feedback from teachers and educators to support continuous improvement and learning progression.

Construction

This phase focuses on utilizing code-based authoring tools to create multimedia-rich content, interactive exercises, and assessments in alignment with prescribed curriculum standards. The meticulously designed user-friendly interface will be implemented to accommodate the cognitive abilities and preferences of Grade 1 learners. Additionally, a star-based reward system will be integrated to encourage and sustain engagement and progress. The application will undergo meticulous development using flutter and firebase coding languages

for rigorous testing and refinement, with iterative enhancements guided by comprehensive feedback from educators and students. This iterative refinement process will persist until the Computer-Assisted Instruction (CAI) modules effectively facilitate the attainment of Filipino language learning objectives in Grade 1 learners.

Cutover

This phase implements pilot testing with Grade 1 students to ensure functionality, usability and educational effectiveness. Real-time comprehensive evaluations will gather feedback from educators specializing in Filipino subjects, ensuring alignment with curriculum standards and appropriateness for learners, while supporting educational effectiveness, engagement, accessibility, and technical performance. Finalize materials and optimize Computer-Assisted Instruction (CAI) Filipino module deployment to grade 1 students will undergo ongoing support and maintenance to address any issues and gather further feedback for continuous improvements.

CHAPTER IV

System Overview

The Interactive Computer-Aided Learning Instruction in Filipino Subject for Grade 1 Students of Central Philippine University (WizKidz) significantly enhances the learning experience for first-grade students by focusing on making the Filipino subject more engaging and easier to grasp. It provides an interactive platform along with a translating module that addresses language barriers commonly encountered when learning through traditional books. Through this platform, teachers can effortlessly upload a diverse array of educational materials to support student comprehension while monitoring their progress in real-time. Its intuitive interface includes a text-to-speech module, facilitating better understanding of lessons, while a rewards-based system encourages student motivation and engagement. By integrating these features, the platform simplifies lesson delivery and promotes active participation and continuous learning among students. This application can be accessed through either a web browser or a dedicated application, but it requires an internet connection for real-time results and progress tracking. The main goal of the system is to establish a flexible and easily accessible platform for Grade 1 students to comprehend their lessons effectively, whether with or without the guidance of their parents or Filipino teacher.

System Objectives:

1. To develop a module where the teachers and admins can upload lessons for students to learn on the application.
2. To create a text to speech feature so students would better absorb pronunciations and learn the words or sentences better.
3. To create a feature wherein a student can dress up their base character into various outfits to be unlocked by stars that came from the rewards based module.
4. To create a module for translating words and phrases, including an audio output button for pronunciation assistance.

5. To create a quiz module as their final test to gauge how much information they have retained and see the overall understanding of the user from the lesson.

System Functions

Admins

Firestore Database. The Firebase DB is the foundation for the proposed real time tracking system that will be implemented in our system as it can serve as the moderator for the application, wherein content can be regulated and manipulated depending on the system requirements.

Admin Panel. The admin panel is a module dedicated for making the administrators' lives on monitoring, maintaining, and controlling the content inside the application easier. Admins are able to change or modify the system and design structure of the application as needed.

Teachers

Lesson Plan Module. This module is dedicated for teachers to upload and manage lessons they upload on the application that they can later on expand and make it more interactive that helps students be more interested in learning the subject.

Student Progress Module. It is a module dedicated to showing the completion percentage that the student has garnered on a certain lesson and, at the same time, seeing what parts their student finds difficult to understand as they explore the different games or stories the module has provided.

User

User Module. This module provides user roles that allows users to access the application, but only the ones admitted by the administrator.

Dictionary Module. This module provides direct translation of words that are taught in every lesson from English to Filipino.

Progress Module. This module tracks the students progress per grading and per module they have answered within the system, it includes their mastery of it.

Lesson Module. This module is where the users' various modules uploaded by their respective teachers can be found and studied.

Gaming Module. This module provides users with an opportunity to test their knowledge and gauge their mastery of lessons. It serves as a supplementary tool for better comprehension and increases the likelihood of recognizing and retaining lessons effectively.

Quiz Module. This module serves as a platform offering users a final test to assess their retention of knowledge and overall understanding gained from the games and activities within the application.

Physical Environment

Hardware Specification

Table 2 contains the minimum hardware requirement for the server side.

Table 2. Hardware Requirement for Server Side

Server Side	
CPU Type/Model	
Input Devices	Mouse and Keyboard
Operating System	Windows 10 and 11
Output Devices	Monitor and Printer

Storage Device	128GB or Higher
Memory	8GB or Higher

Table 3. contains the minimum hardware requirements for the client.

Table 3. Hardware Requirement Client Side

Client Side	
CPU Type/Model	
Input Devices	Mouse and Keyboard
Operating System	Windows 10 and 11
Output Devices	Monitor and Printer
Storage Device	64GB or Higher
Memory	8GB

Software Specification

Table 4. contains the software tools used in the development of the system.

Table 4. Software Specification

Operating System	Windows 10
Back-End	Firebase
Front-End	Flutter

Operating System: Microsoft Windows 10

Windows 10, unveiled by Microsoft in July 2015, serves as a versatile operating system tailored for a range of devices, including personal computers, tablets, embedded systems, and IoT devices. Its official support extends until October 2025, succeeding Windows 7 and 8 with a smooth upgrade process that transfers applications, software, settings, and preferences seamlessly, eliminating the need for re-imaging or system wipes. Offering users and organizations flexibility, Windows 10 allows for customized patching and

updating through manual upgrades via the Windows Update Assistant or automatic updates via Windows Update. Windows 10 incorporates virtualization-based tools like Isolated User Mode, Windows Defender Device Guard, and Windows Defender Credential Guard, isolating data, processes, and user credentials to mitigate potential threats. The OS expands support for BitLocker encryption, ensuring data protection across various platforms, including storage hardware, emails, and cloud services. These comprehensive features position Windows 10 as a robust and secure operating system tailored to meet the demands of modern computing (searchenterprisedesktop.techtarget.com).

Windows 10 is known for its seamless blend of innovation, reliability, and security. Its intuitive interface, broad compatibility, and robust defenses against cyber threats ensure a productive and hassle-free computing experience. With streamlined updates and user-centric design, Windows 10 prioritizes efficiency and user control, making it the optimal choice for modern computing needs.

Back-End: Dart

Dart, developed by Google, is an open-source programming language with applications in both client and server-side development. It is primarily used to create phone applications, IoT devices, and web applications using the Flutter Framework. Introduced in 2011, Dart gained prominence post-2015 with Dart 2.0. It shares syntactic similarities with Java, C, and JavaScript, offering dynamic object-oriented capabilities with closure and lexical scope features. (dart-tutorial- Geeksforgeeks).

Dart offers numerous benefits for backend development, notable among these is its succinct and powerful syntax that simplifies the coding process. This characteristic not only makes development more efficient but also less complex. Dart's ability to execute code quickly further enhances backend system performance, particularly for applications that deal with large volumes of data or a high number of user requests.

Another significant advantage of Dart in the backend development sphere is its flexible typing system, which supports dynamic typing. This feature allows developers to write code that is both adaptable and versatile, effectively meeting a wide range of backend needs. Dart also supports contemporary programming features like asynchronous operations, which are crucial for managing multiple tasks concurrently in backend services. Although Dart is often associated with frontend development through Flutter, its capabilities extend to backend processes as well. This dual functionality enables developers to achieve consistent and efficient coding practices across both web and mobile applications. Altogether, Dart's combination of efficiency, flexibility, and modern features make it an attractive option for backend development projects, particularly in settings that value rapid development cycles and high-performance outcomes. (difference-between-dart-and-java - Geeks-for-Geeks)

Back- End: Firebase

Firebase initially operates under the name Envolv began as an online chat service provider, offering API integration for various websites. However, its utilization shifted dramatically when developers started employing it for real-time data exchange among users, particularly for transmitting application data like game states. This led to the divergence of Envolv's architecture from its chat functionality. Co-founders James Tamplin and Andrew Lee took this foundational concept and expanded it into the modern Firebase platform we know today, with its inception occurring in 2012.

Firebase serves as a comprehensive tool for developers, facilitating app building, management, and growth. With Firebase, developers can accelerate app development without the need for extensive programming knowledge, as its features are designed to be user-friendly and efficient. This caters to various platforms, including Android, iOS, web, and

Unity, offering services such as cloud storage backed by NoSQL databases for flexible and scalable data management ([Firebase - Introduction - GeeksforGeeks](#)).

Firebase was used for its comprehensive suite of tools that simplify the development and management of web and mobile applications. This offers a real-time database and Cloud Firestore for efficient data storage and synchronization, making it ideal for apps requiring real-time updates. Firebase Authentication supports easy user sign-in options with multiple providers. Its Hosting service allows for quick deployment of web applications, while Cloud Functions enable serverless computing to extend app functionality. Firebase Storage provides secure file uploads and downloads. Analytics and Performance Monitoring tools offer insights into app usage and performance, helping to improve user experience. Remote Config facilitates app behavior and appearance adjustments without needing updates, and its integration with AdMob allows for app monetization through advertising. Essentially, Firebase streamlines backend tasks, letting developers focus on creating engaging user experiences.

Front- End: Flutter

Flutter is Google's portable UI toolkit for crafting beautiful, natively compiled applications for mobile, web, and desktop from a single codebase. Flutter works with existing code, is used by developers and organizations around the world, and is free and open source. Flutter is recognized as the most popular frontend framework used by mobile app developers as it allows them to develop cross-platforms fast with good performance. In addition, many developers have already adopted Flutter as the main framework used for mobile app development, and the number is going up even now. The graph below proves its popularity

(<https://blog.function12.io/tag/flutter/what-are-the-essentials-for-flutter-front-end-developers/>)

Cost of Development

Table 5 contains the cost associated with the hardware requirement.

Table 5. Hardware Development Cost

Equipment	Amount
1 System Unit	P 25,000.00
1 Monitor	P 5,500.00
1 Keyboard and Mouse	P 1,500.00
1 Printer	P 8,000.00
Total	P 40,000.00

Table 6 contains the estimated cost of the software developed.

Table 6. Software Development Cost

Researcher Role	Amount
Project Leader	P 40,000.00
Programmer	P 45,000.00
Researcher	P 20,000.00
System Admin	P 35,000.00
Analyst	P 38,000.00
GUI Designer	P 20,000.00
Total	P 198,000.00

System Depreciation

Hardware Depreciation

Table 7. presents the hardware depreciation of the developed study.

Hardware Depreciation rate (Rate of Depreciation = Cost/Year)

Hardware Cost = Php 40,000.00

Depreciation Year = 5 Years

Rate of Depreciation = Php 8,000.00

Table 7. Hardware Depreciation

Year	Amount
0	P 40,000.00
1	P 32,000.00
2	P 24,000.00
3	P 16,000.00
4	P 8,000.00
5	P 0.00

Software Depreciation

Table 8. presents the software depreciation of the developed study.

Software Depreciation rate (Rate of Depreciation = Cost/Year)

Software Cost = Php 198,000.00

Depreciation Year = 10 Years

Rate of Depreciation = Php 19,800.00

Table 8. Software Depreciation

Year	Amount
0	P 198,000.00
1	P 178,200.00
2	P 158,400.00
3	P 138,600.00
4	P 118,800.00
5	P 99,000.00
6	P 79,200.00
7	P 59,400.00
8	P 39,600.00

9	P 19,800.00
10	P 0.00

Tangible and Intangible Benefits

Tangible Benefits

- The application provides a real time tracking system.
- Reduces the use of paper and writing materials.

Intangible Benefits

- Confidentiality on user's stored data.

Use Case Diagram of the Proposed System

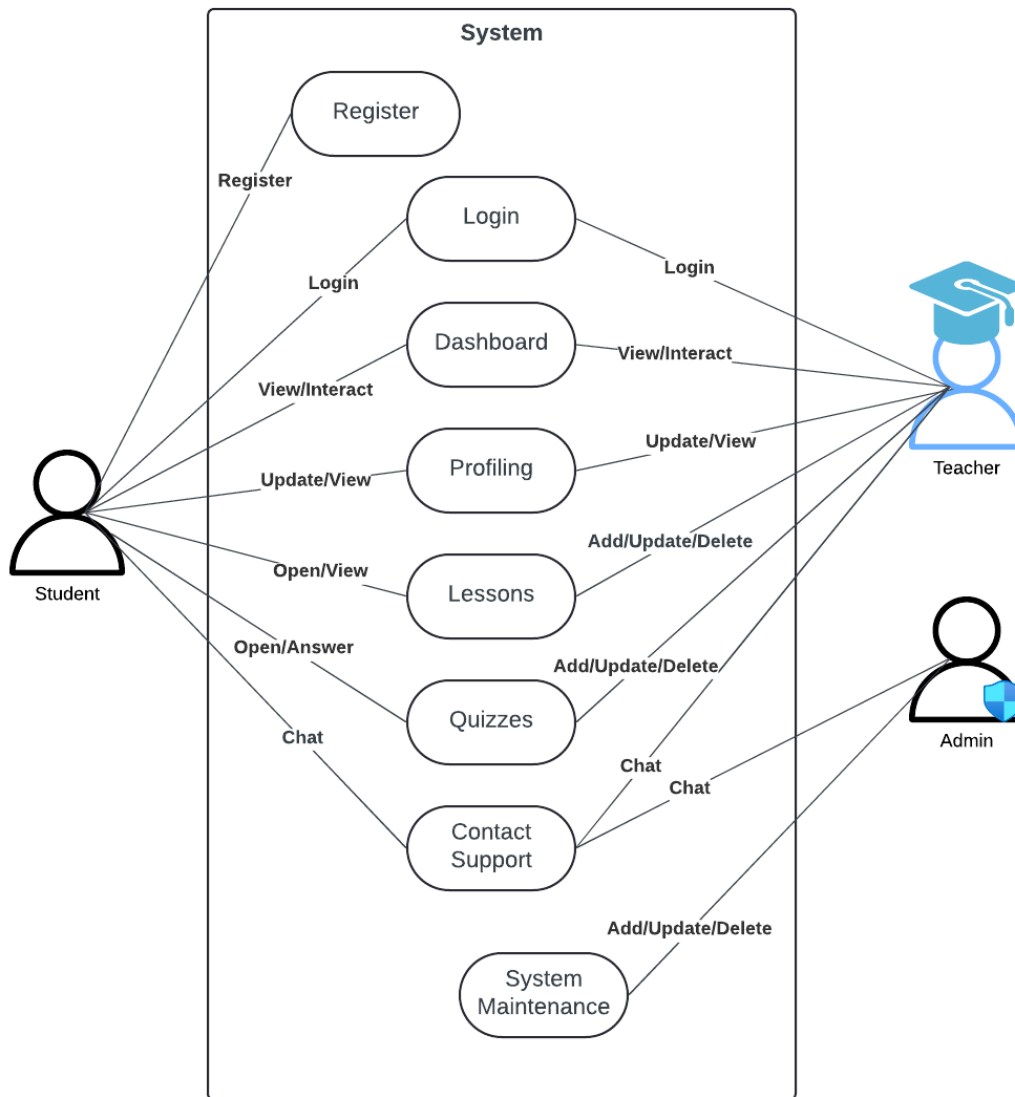


Figure 5. Use Case Diagram of the Proposed System

Figure shows the use case diagram of the proposed system for the students, teachers, and admins. The students and the teachers can access and interact with the mobile application while the admins (programmers) use the backend of the application.

The teachers can access the application via the web interface, facilitating streamlined processes for the uploading of quizzes, modules, and lessons, thereby enhancing efficiency

and convenience in their instructional tasks. There is no necessity for teachers to engage in the registration process, as authorized accounts will be provided to them.

The students must complete a registration process to establish a profile. No password is required for users, as the application is exclusively designed for grade 1 students. In instances where students are unable to create their own profiles, they have the option to utilize their parent or guardian's email address for registration purposes.

The administrators and programmers have the privileges to access the server housing both the accumulated data and the source code of the application. With this access, they are capable of both modifying and reviewing all collected data comprehensively.

Sequence Diagram of the Proposed System

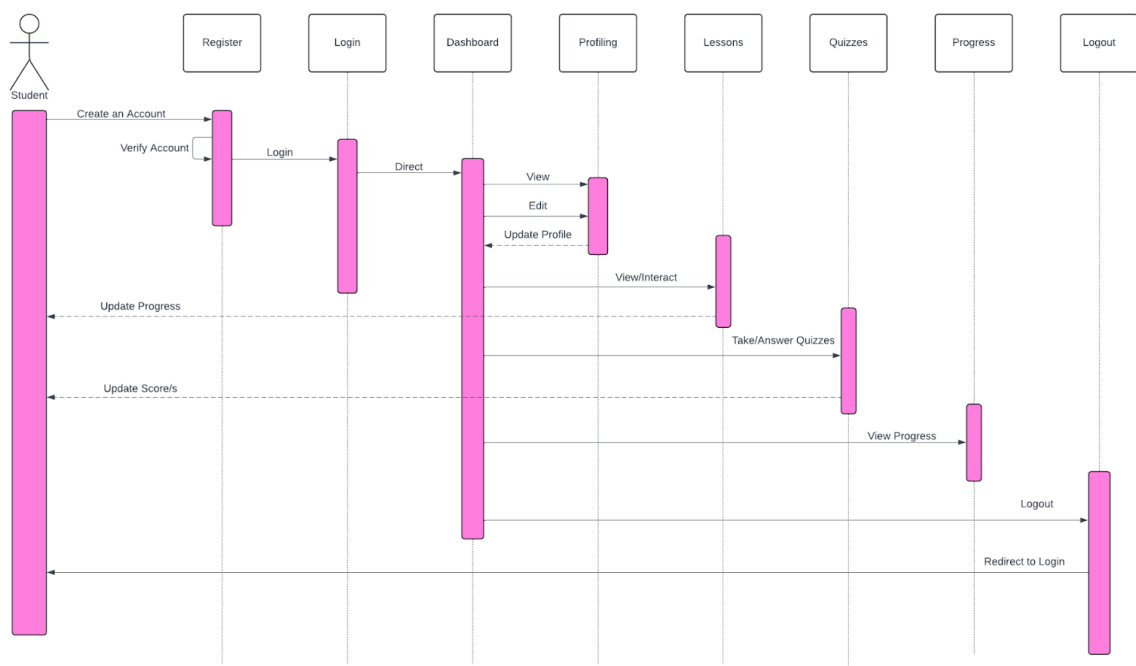


Figure 6. Sequence Diagram of the Proposed System - Teacher

Figure 6 depicts the sequence diagram illustrating the process after logging into the application. Teachers are capable of comprehensive management tasks including adding,

editing, and viewing all aspects pertaining to the application's dashboard, managing lessons, quizzes, and the progress of the students.

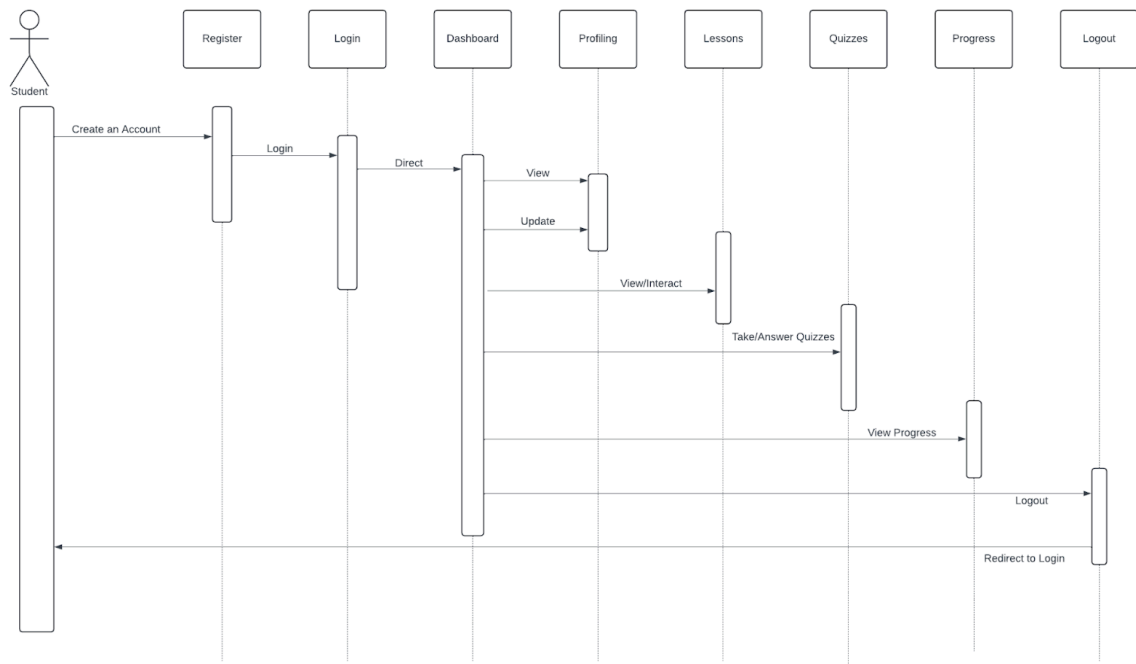


Figure 7. Sequence Diagram of the Proposed System - Students

Upon entering their email or login credentials, the student will be directed to the dashboard interface, Here, they will gain access to the array of lessons and quizzes, modify their profile where they can edit their characters using their star point reward for every module that they accomplish, affording them the opportunity to select from the various available options.

Activity Diagram of the Proposed System

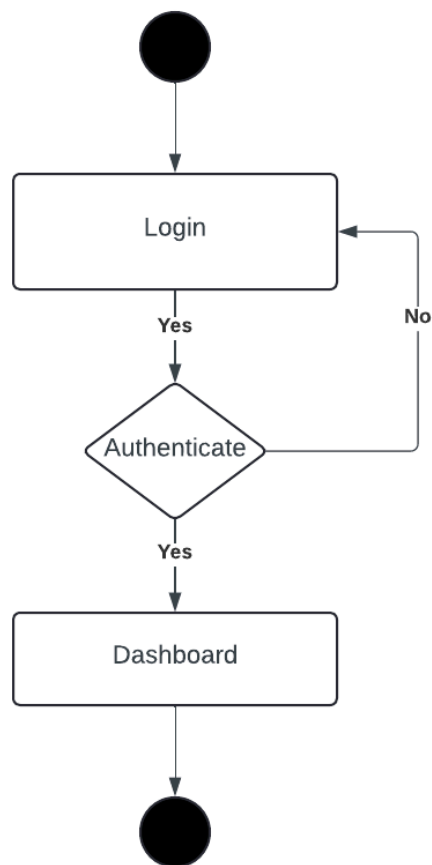


Figure 8. Activity Diagram - Access system for all users

Figure 8 illustrates the procedure for user access in a system. It commences with the user logging in by inputting their credentials. Following this, the system cross-references these credentials with an authorized user database. If the credentials are confirmed, the system proceeds to authenticate the user and permits access to the dashboard. If the credentials are invalid, access is refused, prompting the user to attempt again.



Figure 9. Activity Diagram - Navigating and Viewing Dashboard

Figure 9 depicts the user's navigation process and dashboard interaction within a system. It starts with the user initiating the dashboard page and subsequently enables them to explore various dashboards or delve into specific datasets. Moreover, users are given the option to export data directly from the dashboard.

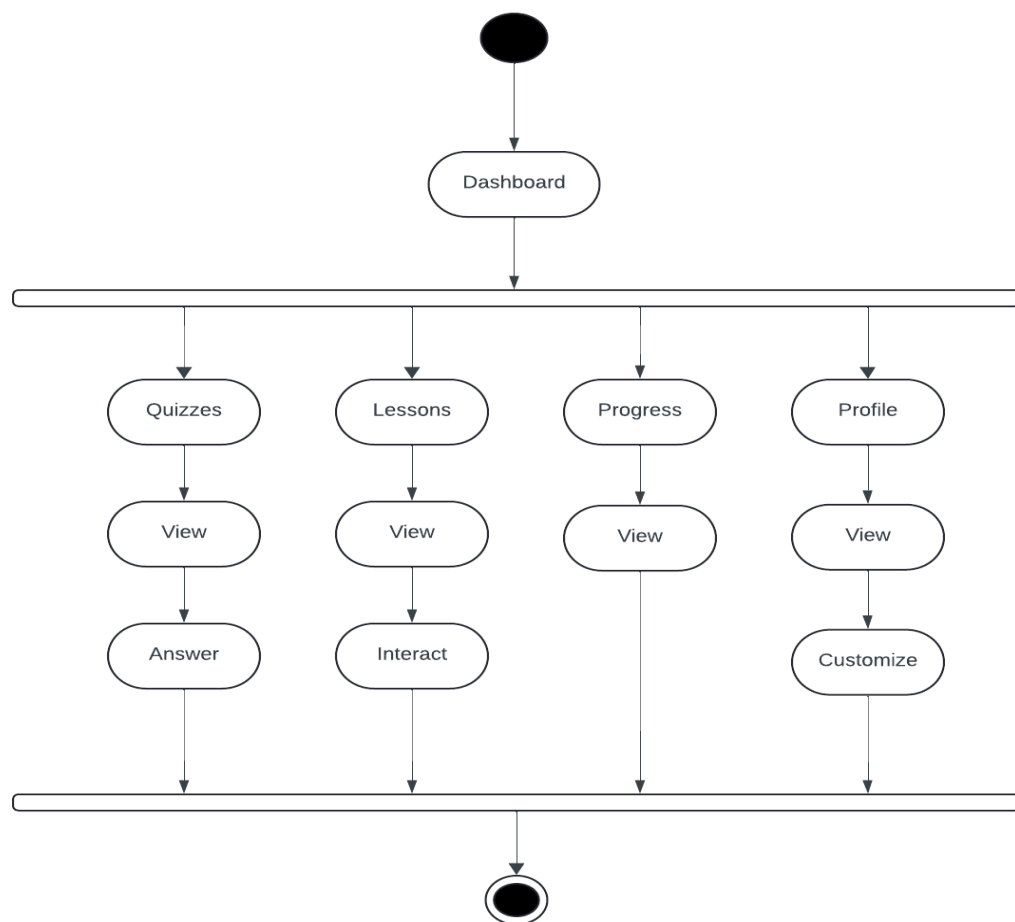


Figure 10. Activity Diagram - Students

Figure 10 encompasses key features such as direct access to lessons, quizzes, progress tracking, and profile management. Students can seamlessly navigate through their coursework, engage with lessons, assess their understanding through quizzes, monitor their progress, and manage their profiles—all from a single, user-friendly dashboard.

By integrating these functionalities, the dashboard enhances user engagement, streamlines the learning process, and provides students with a holistic tool for optimizing their educational experience.

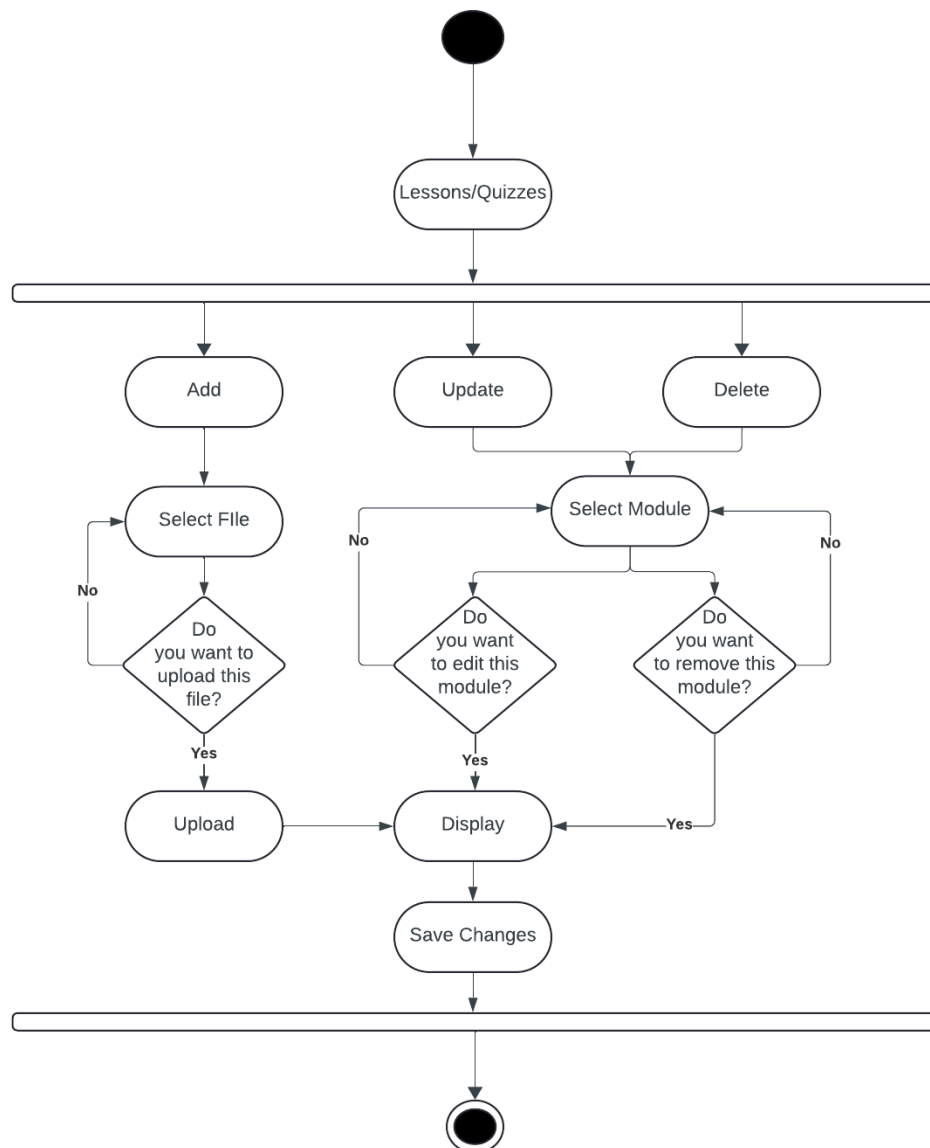


Figure 11. Activity Diagram - Add/Update/Delete Lessons/Quizzes

Figure 8 provides a clear and systematic representation of how teachers can manage module content effectively, enhancing the learning experience for students. By enabling seamless modifications or enhancements to existing content, it ensures its relevance and accuracy over time. Additionally, it empowers teachers to remove outdated or redundant

materials from the module dashboard, maintaining its integrity and optimizing its utility for students. This diagram serves as a valuable tool for teachers, offering a visual guide to streamline content management processes and facilitate effective instructional delivery within the educational system. Its user-friendly interface promotes efficient navigation and organization of educational resources, ultimately contributing to an enriched and dynamic learning environment for both teachers and students alike.

Database Structure

Database Name: WizKidzDB

Table No: 1

Primary Key: User_ID

Foreign Key: First_Name, Last_Name, Contact_ID, Year_Created, Section, Email

Description: This database table includes the basic information of the user.

KEY	Field Name	Data Type	Size	Description
PK	User_ID	INT	20	Identification number of User
FK	First_Name	VARCHAR	100	First name of User
FK	Last_Name	VARCHAR	100	Last name of User
FK	Year_Created	Date	20	Creation year of account
FK	Section	VARCHAR	100	Section of the User
FK	Email	VARCHAR	100	Email address of the User

Database Name: WizKidzDB

Table No: 2

Primary Key: Teacher_ID

Foreign Key: Lesson_ID

Description: This database table contains the modules uploaded or provided by the teachers per lesson or grading.

KEY	Field Name	Data Type	Size	Description
PK	Teacher_ID	INT	20	Identification of teacher
FK	Lesson_ID	INT	10	Lesson number
	Modules	VARCHAR	100	Lessons provided

Database Name: WizKidzDB

Table No: 3

Primary Key: User_ID

Foreign Key: Activity, Quiz, Exams, Score, Lesson_ID

Description: This database table contains the score, lessons, activities, tests and data of the lesson, along with the assessment results.

KEY	Field Name	Data Type	Size	Description
PK	Quiz_ID	INT	20	Identification of Quiz number
FK	Activity	VARCHAR	100	Series of games
FK	Assessment	VARCHAR	100	Series of questions
FK	Scores	String	100	Results
FK	Lesson_ID	INT	10	Lesson number

Network Topology

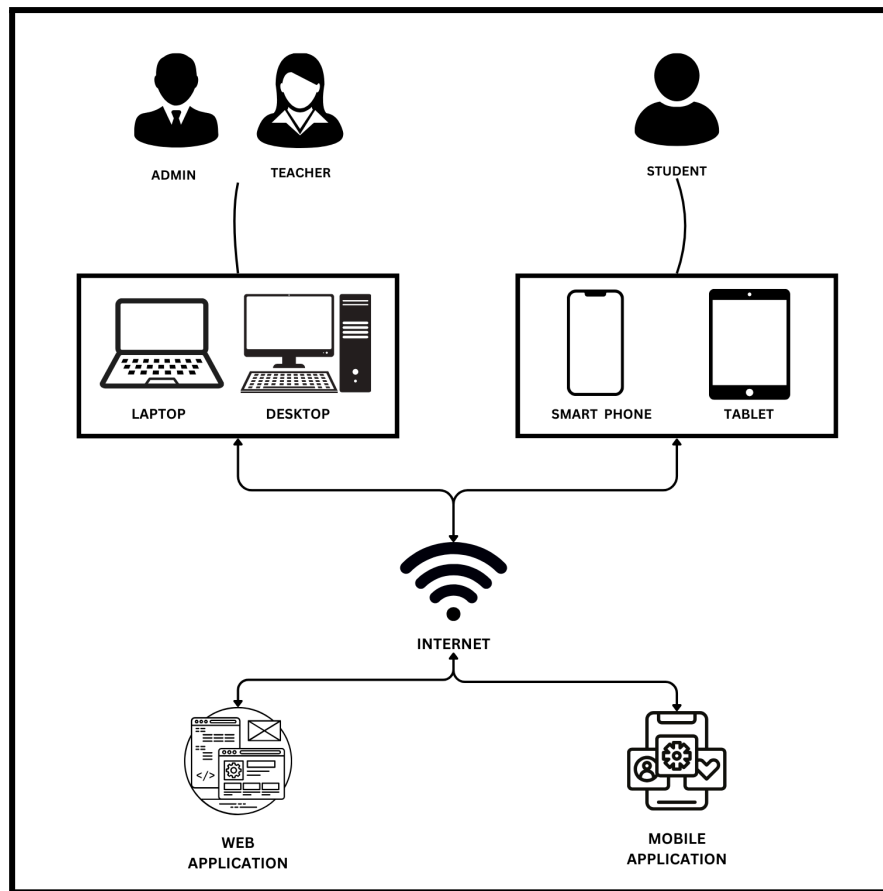


Figure 12. Network Topology

Figure ?. is the planned network layout for the system. The mobile application can be accessed through the internet by the users while the web application can be accessed by both the teachers and administrators.

Design and Implementation Issues

The Interactive Computer-Aided Learning Instruction in Filipino Subject for Grade 1 Students of Central Philippine University is a versatile cross-platform application comprising several modules tailored for Grade 1 learners.

The first module is dedicated to real-time user monitoring, empowering administrators to oversee individual progress effectively. The second module focuses on content monitoring and system adjustments as necessary. The third module serves as an

uploading platform for teachers, facilitating easy access to lesson materials and adjustments.

Following that, there's a module designed for teachers to track the progress of each student under their guidance, identifying areas needing additional attention. The main screen module offers an overview of all available features within the application.

A dedicated dictionary module allows users to look up or verify the meaning or direct translation of unfamiliar words encountered in their lessons. The progress module enables students to monitor their mastery of each lesson offered, tracking their learning journey Effectively.

The lesson module provides access to various lessons uploaded by teachers, allowing students to study ahead or prepare for mini-games within the application. The gaming module serves as a platform for students to test their knowledge and memory retention from the lessons and modules. Finally, the last module which is the quiz module, which offers users a comprehensive final test to assess their overall understanding of the lessons they have engaged with throughout the application.

