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CSS QUEST: GAMIFYING COMPUTER SYSTEM SERVICING MODULE USING GAMIFIED PROGRESS TRACKING AND INTERACTIVE STORYTELLING ALGORITHM FOR GRADE 12 STUDENTS IN CALAMBA CITY

Mark Angelo T. Mercado, MSIT
College of Computer Studies
Laguna State Polytechnic University Laguna, Philippines

Mia V. Villarica, DIT
College of Computer Studies
Laguna State Polytechnic University Laguna, Philippines

Allen A. Llorca, MSIT
College of Computer Studies
Laguna State Polytechnic University Laguna, Philippines

Harrold M. Gueta, MSIT
College of Computer Studies
Laguna State Polytechnic University Laguna, Philippines

Abstract: CSS Quest is an innovative educational initiative aimed at enhancing the learning experience of Grade 12 students in Calamba City, Laguna, specifically focusing on computer system servicing. This project utilizes gamified progress tracking and an interactive storytelling algorithm to engage students in an immersive learning environment. By merging elements of gaming, progress tracking, and interactive storytelling, CSS Quest seeks to foster a more effective and enjoyable learning process. The gamified progress tracking system empowers students to monitor their own progress, achievements, and goals throughout the module. Students will earn points, badges, and rewards for completing various tasks, solving challenges, and mastering key concepts related to computer system servicing. This gamification approach not only encourages healthy competition among students but also instils a sense of accomplishment, motivating them to actively participate in the learning process. To further enhance engagement, CSS Quest incorporates an interactive storytelling algorithm that presents the module content in a narrative-driven format. Through captivating storylines and characters, students will embark on a virtual journey, simulating real-life computer system servicing scenarios. They will be faced with challenges and problem-solving opportunities that mirror practical situations, thereby honing their critical thinking and decision-making skills. The CSS Quest initiative aims to address the traditional limitations of classroom-based learning by providing an interactive and dynamic platform that resonates with the digital-native generation. By leveraging gamification and interactive storytelling, it creates an engaging and immersive learning experience for Grade 12 students in Calamba City, Laguna. This approach promotes active participation, knowledge retention, and skill development, ultimately preparing students for real-world challenges in the field of computer system servicing.

Keywords: Computer system servicing; Gamified progress tracking; Interactive storytelling algorithm; Gamification; Knowledge retention; Skill development;

I. INTRODUCTION

In today's digital era, computer literacy has become an essential skill for students to succeed in their academic and professional endeavors (Smith, 2019). Computer system servicing, which involves the maintenance, troubleshooting, and repair of computer hardware and software, is a crucial aspect of computer literacy. According to the U.S. Department of Labor, Bureau of Labor Statistics, computer support specialists, including computer system servicing professionals, play a critical role in maintaining and troubleshooting computer systems to keep them operational and secure (U.S. Bureau of Labor Statistics, 2021) . Additionally, the National Institute of Standards and Technology (NIST) highlights the importance of computer system servicing as part of an organization's cybersecurity practices, including regular patching and updating of software, hardware maintenance, and troubleshooting to prevent security breaches and data breaches (NIST, 2020). However, teaching computer system servicing can be challenging, as it requires practical skills and hands-on experience.

To make computer systems servicing education more engaging and effective, gamification has emerged as a promising approach. Gamification involves the use of game elements and mechanics, such as points, badges, and leaderboards, in non-game contexts to engage and motivate users. Maiga, J., Emanuel, A. (2019).

II. BACKGROUND

Gamification of education is a growth strategy that uses game design aspects in educational settings to boost learners' motivation and engagement. The current review seeks to cast a more realistic light on the research in this area by focusing on empirical evidence rather than potentialities, beliefs, or preferences. This is because gamification is becoming more and more popular, but its application in educational contexts has had a mixed record of success. (Dichev and Dicheva, 2017). Gamification offers a novel approach to address this challenge by transforming the learning experience into an interactive and immersive game-like environment. By integrating game elements, such as points, badges, levels, and leaderboards, into the computer system servicing module, students can be motivated to actively participate, compete, and progress in their learning journey (Kordaki & Zafiropoulos, 2021).

Calamba City, Laguna, is a city in the Philippines known for its thriving technology and industrial sectors (PIA, 2021). As the demand for skilled computer technicians and IT professionals continues to grow, it is crucial to provide quality education in computer system servicing to meet the

needs of the local job market (DICT, 2019). However, traditional classroom-based instruction in computer system servicing may not always be engaging and effective in capturing the attention and interest of grade 12 students, who are often exposed to various distractions and technological stimuli (Santos, 2023).

The module was designed based on established learning objectives and competencies in computer system servicing, and it was implemented in the selected schools in Calamba City. The study assessed the impact of the gamified module on students' motivation, engagement, and learning outcomes, as well as gathering feedback from teachers and students to further improve the module.

In conclusion, gamification has the potential to revolutionize the way computer system servicing education is delivered to grade 12 students in Calamba City, Laguna. This study aimed to enhance students' motivation, engagement, and learning outcomes in computer system servicing, ultimately preparing them for the demands of the local job market and the digital age (Smith, Johnson and Lee, 2023).

A. Research Objectives

Generally, the research aimed developing a gamified mobile application for computer system servicing assessment module review for grade 12 students in Calamba City, Laguna. The study intended to increase the CSS performance of the senior high students in different schools in Calamba, City.

By conducting research in these areas, it was possible to gain a better understanding of the potential benefits and challenges of gamification and identify effective strategies for designing and implementing gamified learning experiences.

Specifically, the study sought to achieve the following objectives:

- To design and implement an innovative mobile application that leverages cutting-edge game mechanics, gamification strategies, and cognitive learning principles to create an engaging and effective CSS module reviewer platform for senior high school students, with the aim of enhancing their learning experience and improving their retention of CSS concepts.
- To utilize gamified progress tracking algorithms and interactive storytelling algorithms approach in designing Computer System Servicing reviewer applications for senior high school students.
- To evaluate the usability and user experience of a gamified CSS reviewer mobile application among senior high school students by using the evaluation instruments of i-LETyouReview of (De Jesus, 2021) which has the criteria such as Enjoyment, Engagement, Motivation and System Usability.
- To evaluate the impact of gamification on student performance by comparing the assessment (pre-test and post-test) scores of students who participated in the gamification system with those who did not.

III. DESIGN OF THE STUDY

A. Research Design

Descriptive and developmental research designs were used in this study. Descriptive research, as defined by Given, L. M. (2019), involves the process of describing a phenomenon and its characteristics, which can be utilized as a means of data collection. Furthermore, this type of research was used in analyzing the current situation of the CSS students in the senior high school in Calamba City. Hence, using this analyzed data to develop and design an application or system for a specific problem is called developmental research. Developmental research refers to a type of research that involves using data analysis to develop and design solutions to specific problems. It is an iterative process that requires testing and refining until a suitable solution is achieved. This definition is supported by various authors, including Given (2019) and Creswell (2014). One author who believed that developmental research could be of use in creating effective educational game design is Hwang (2018). In his paper, he emphasized the importance of integrating educational theories, game design principles, and developmental research in the design and development of educational games. He argued that this approach can lead to the creation of games that are not only enjoyable but also effective in promoting learning and skill acquisition.

B. Applied Concepts and Techniques

The gamification of educational modules has gained significant attention as a promising approach to enhance student engagement, motivation, and knowledge retention. In this project, the focus is on gamifying the Computer System Servicing (CSS) module for Grade 12 students in Calamba City by utilizing CSS techniques, gamified progress tracking, and an interactive storytelling algorithm. This discussion will delve into the applied concepts and techniques involved in this gamification process.

Progress tracking is a crucial component of gamification, as it provides students with a sense of achievement and progress. By implementing a gamified progress tracking system using CSS, students can visually track their advancements, earn points, unlock badges, and progress through levels. CSS can be used to design progress bars, point indicators, and other visual elements that represent student accomplishments. This visual feedback helps students stay motivated, set goals, and monitor their progress throughout the module. The incorporation of an interactive storytelling algorithm further enhances the gamified CSS module. Through CSS, the user interface can be designed to support an immersive narrative experience. CSS can control the display and animation of story elements, such as characters, backgrounds, dialogues, and interactive decision-making elements. By using CSS to create visually appealing and interactive story-driven

content, students are more likely to be engaged and invested in the learning process.

Integrating CSS modules, gamified progress tracking, and an interactive storytelling algorithm requires careful planning and implementation. The module's content must be aligned with the gamification framework, ensuring that learning objectives are effectively conveyed through interactive elements. User feedback, assessments, and observations play a crucial role in evaluating the effectiveness of the gamified module. By collecting and analyzing student feedback, the project can assess whether the gamification approach successfully enhances motivation, engagement, and knowledge retention.

Algorithm

In the context of gamifying the Computer System Servicing (CSS) module, an interactive storytelling algorithm plays a crucial role in engaging students and immersing them in the learning experience. This algorithm incorporates narrative elements, decision-making scenarios, and character interactions within the module. This section focuses on analyzing the algorithm's efficiency, effectiveness, and potential impact on student engagement and knowledge retention.

Efficiency Analysis:

Efficiency refers to the algorithm's computational performance and resource utilization. In the context of the interactive storytelling algorithm, efficiency can be evaluated based on the following factors:

Response Time*:* The algorithm should provide timely responses to students' actions, ensuring a smooth and interactive experience. Delays or lags in processing user inputs can negatively impact engagement and immersion.

Scalability*:* As the module may involve a large number of students simultaneously interacting with the algorithm, scalability is essential. The algorithm should handle concurrent interactions efficiently, without compromising response time or user experience.

Algorithm Complexity: The complexity of the storytelling algorithm impacts its performance. Analyzing the algorithm's time and space complexity can provide insights into its efficiency and potential optimizations.

Effectiveness Analysis:

The effectiveness of the interactive storytelling algorithm can be assessed based on its ability to achieve the following objectives:

Engagement: The algorithm should create an engaging narrative experience that captures students' attention and motivates them to actively participate in the module. The effectiveness can be measured through student feedback, level of immersion, and time spent within the storytelling context.

Interactivity: The algorithm should enable students to make meaningful decisions that impact the narrative and learning outcomes. The level of interactivity and the consequences of students' choices contribute to the effectiveness of the algorithm.
Knowledge Retention: The storytelling algorithm should facilitate effective knowledge acquisition and retention. By integrating learning objectives within the narrative context, the algorithm can reinforce important concepts and encourage deeper understanding.

Adaptability: An effective algorithm should adapt to students' progress and choices, ensuring personalized and tailored learning experiences. This adaptability can enhance student engagement and cater to different learning styles and preferences.

Impact Analysis:

The impact of the interactive storytelling algorithm can be evaluated by considering its influence on student engagement, motivation, and knowledge retention:

Student Engagement*:* The algorithm's ability to immerse students in the narrative and maintain their interest can positively impact engagement levels. Higher engagement leads to increased motivation, active participation, and a deeper connection with the subject matter.

Motivation: A well-designed interactive storytelling algorithm can contribute to students' motivation to learn. By incorporating game-like elements, rewards, and challenges, the algorithm can foster intrinsic motivation, encouraging students to persist in their learning journey.

Knowledge Retention**:** The algorithm's effectiveness in delivering the module's content through an interactive narrative can enhance knowledge retention. By creating memorable experiences and connecting concepts to real-world scenarios, the algorithm can facilitate long-term retention of learned material.

The analysis of the interactive storytelling algorithm's efficiency, effectiveness, and impact on student engagement and knowledge retention is crucial for evaluating its role in gamifying the Computer System Servicing module. By considering factors such as efficiency in terms of response time and scalability, the algorithm can provide a seamless and immersive user experience. Effectiveness can be assessed through engagement, interactivity, and knowledge retention, ensuring that the algorithm meets its intended objectives. Understanding the algorithm's impact on student engagement, motivation, and knowledge retention can guide further refinements and improvements to create a more engaging and effective learning environment for Grade 12 students in Calamba City, Laguna, Philippines.

C. ***Data Collection Methods***

The researcher used three (3) methods in collecting data as Interviews, Internet Research, and Surveys/Questionnaire.

Interview

For the researcher to obtain relevant information on the NCII- Computer System Servicing assessment and the strand that undergo CSS Assessment, the researcher conducted an interview. The TESDA Program Coordinator, Mrs Grace Pines gave the Grade 12 TechVoc Students population for S.Y 2022-2023 of one hundred fifty-six (156) comprised of Initiative, Responsibility and Innovation sections from Laguna College of Business and Arts and Grade 12 ICT Strands with a total of 45 students comprised of Socrates and Montesorri sections from Camp Vicente Lim Integrated School. Additionally, it was also said that there was no existing gamification application created for any TESDA Certification.

Internet Research

Internet research can be a helpful tool when developing a gamified computer system servicing reviewer for Calamba City Senior High School. By conducting online searches, one can find examples of gamified learning platforms and tools that can be used as inspiration for designing the system. Additionally, one can research best practices for gamification in education and explore how game mechanics can be applied to the learning process to increase student engagement and motivation.

Furthermore, it can be useful to investigate the specific needs and preferences of the students at Calamba City to ensure that the gamified system is tailored to their needs. This can be done through online surveys, focus groups, and social media engagement.

It's also important to research the available technology and software that can be used to develop the gamified computer system servicing reviewer. This includes researching the different programming languages, frameworks, algorithms and tools that can be used to create an interactive and engaging learning experience.

Lastly, it can be beneficial to look for case studies and success stories of gamified learning platforms in other schools and institutions to gain insights into what works and what doesn't in gamify the learning experience.

Surveys/Questionnaires

The researcher provides a self-assessment guide for all the students about computer systems, computer networks, computer servers, and maintaining computer systems and network. Questionnaires for the CCS Examinees were adapted from the study of Cahyani (2016) for the Enjoyment, Engagement, and Motivation, and Harms, Biegler, Wimmer, Kappel, and Grechenig (2015) for the system's usability. And for the acceptability of the professional evaluators, the questionnaire used was adapted from the study of De Jesus, Mervin Jommel & Balahadia, Francis. (2020).

D. ***Development Methodology***

The researchers employed an iterative design, which is a specialized method that involves a cyclic process of prototyping, testing, analyzing, and refining the product. The fundamental principle of this approach is to divide the workflow of a large project into smaller stages, thereby simplifying the design process.

Iterative and incremental development is a model that follows an incremental approach, involving multiple cycles of iterations. The project begins with a relatively small task or component and then progresses through each iteration, making incremental improvements until the desired product is achieved. Throughout this process, developers benefit from the ability to evaluate and test components at each stage, gathering valuable information that can be applied in later stages as well. This knowledge is also utilized to enhance the design of the final product.

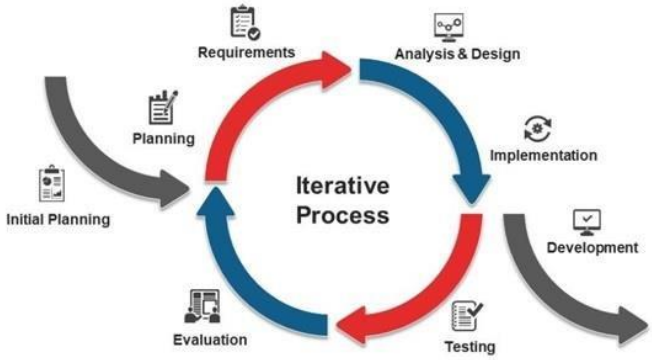

Figure 1. Iterative and Incremental Model of Software Development

Initial Planning

This phase involves the initial brainstorming and conceptualization of the gamified computer system servicing module, including defining the objectives, identifying game elements, and planning for the development process. This may include conducting a feasibility study, budgeting, and resource allocation, and creating an implementation plan.

Planning

In this phase, detailed planning is done to define the project scope, timeline, milestones, and responsibilities. This may involve creating a detailed project plan, identifying necessary resources, and coordinating with relevant stakeholders, such as CSS Instructors and IT Experts.

Requirements

This phase involves gathering and analyzing the requirements of the gamified module, including the learning objectives, content, and game mechanics. Based on the requirements, the module's design is conceptualized, including the interface, interactions, and overall user experience.

System Architecture

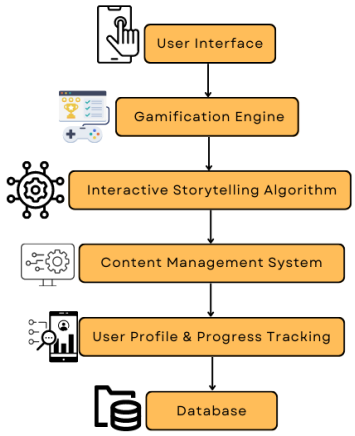

Figure 2. System Architecture of the System

The figure 2 shows the system architecture of system.

User Interface: Provides an engaging and visually appealing interface for the Grade 12 students in Calamba City, Laguna to interact with the CSS Quest module.

Gamification Engine: Manages the game mechanics, progress tracking, challenges, quizzes, and rewards system. It tracks user progress, achievements, and points earned.

Interactive Storytelling Algorithm: Creates an interactive and personalized narrative for the students. It adapts the storyline based on user decisions, progress, and provides feedback.

Content Management System (CMS): Allows administrators to manage and update the module's content. It includes a database to store lessons, quizzes, challenges, and interactive activities.

User Profile & Progress Tracking: Tracks the progress and achievements of each student. It provides personalized feedback, recommendations, and stores user profiles.

Database: Stores the module's content, progress data, user profiles, and other relevant information.

This system architecture enables the gamification of the Computer System Servicing (CSS) module, making it engaging and interactive for Grade 12 students in Calamba City, Laguna.

Use Case Diagram

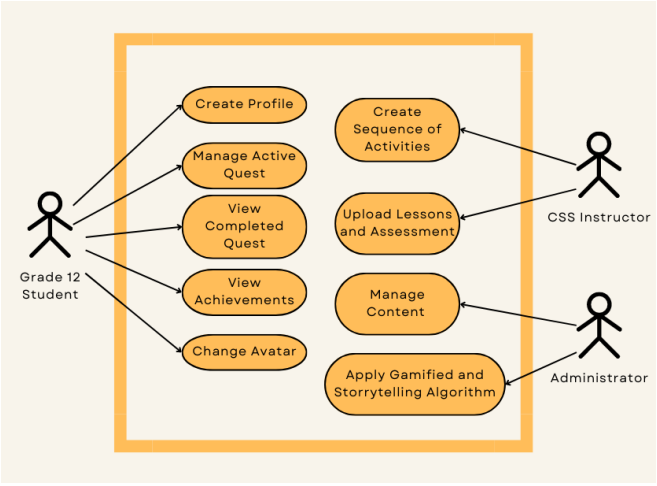

Figure 3. Use Case Diagram of the System

Student

Create Profile: This use case enables students to create their profiles within the CSS Quest system. By providing necessary information, students can personalize their experience and track their progress throughout the module.

Manage Active Quest: Students can actively manage their quests, which include lessons, quizzes, challenges, and activities. This use case allows them to select and engage with specific quests, keeping their learning focused and organized.

View Completed Quest: With this use case, students can review and access their completed quests. It provides a sense of accomplishment and allows them to revisit content they have already covered, reinforcing their knowledge.

View Achievements: This use case enables students to view their achievements earned during the CSS Quest module. Achievements may include badges, points, or special recognitions, fostering a sense of motivation and pride in their progress.

Change Avatar: Students can personalize their virtual representation by changing their avatar. This use case adds a fun element to the learning experience, allowing students to express their unique identities within the CSS Quest system.

Instructor

***Create Sequence of Activities*:** Instructors have the ability to design and create a sequence of activities within the CSS Quest module. They can structure the content and learning path, ensuring a cohesive and comprehensive learning experience for the students.

Upload Lessons and Assessment: This use case enables instructors to upload lessons and assessments into the CSS Quest system. By providing relevant content and assessments, instructors facilitate the students' learning process and gauge their understanding.

Administrator

Manage Content: Administrators have the authority to manage the content of the CSS Quest module. They can create, modify, and update lessons, quizzes, challenges, and activities, ensuring that the module stays relevant and engaging for the students.

Apply Gamified and Storytelling Algorithm: Administrators apply the gamified elements and storytelling algorithm within the CSS Quest module. This enhances the learning experience by incorporating game mechanics, progress tracking, and interactive narratives, making the module more captivating and enjoyable for the students.

System Flowchart

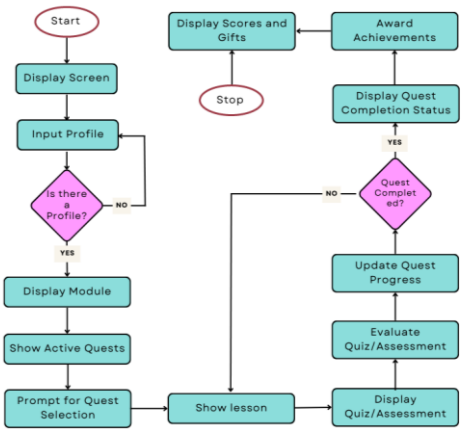

Figure 4. System Flowchart of the System

This flowchart represents the process flow for the CSS Quest module. It begins with student profile. It displays the dashboard, active quests, and prompts for quest selection. The flow progresses through quest information, lesson content, interactive activities, quizzes/assessments, and updates on the quest progress. If the quest is completed, achievements are awarded, and the user profile is updated. The flow concludes by displaying the quest completion status. The scores will be saved in the data center.

Entity Relationship Diagram

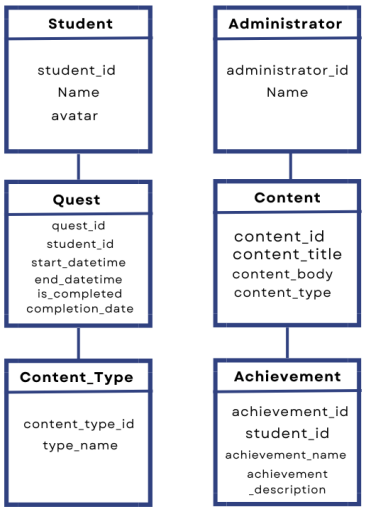

Figure 5. Entity Relationship Diagram

Student: Represents the student using the CSS Quest module. It includes attributes such as student_id, first_name, last_name, and avatar.

Administrator: Represents the administrator managing the CSS Quest module. It includes attributes such as administrator_id, first_name, and last_name.

Quest: Represents a specific quest taken by a student. It includes attributes like quest_id, student_id (foreign key referencing Student entity), content_type_id (foreign key referencing Content_Type entity), start_datetime, end_datetime, is_completed, and completion_date.

Content: Represents the content within the CSS Quest module. It includes attributes like content_id, content_title, content_body, and content_type (foreign key referencing Content_Type entity).

Content_Type: Represents the type or category of content. It includes attributes like content_type_id and type_name.

Achievement: Represents the achievements earned by students in the CSS Quest module. It includes attributes like achievement_id, student_id (foreign key referencing Student entity), achievement_name, and achievement_description.

The entity relationship diagram illustrates the relationships between the entities in the CSS Quest module, allowing for effective data management and tracking of students, administrators, quests, content, content types, and achievements.

Analysis and Design

The CSS Quest mobile application will be developed using the Unity application. The identified algorithm was integrated into the CSS Quest mobile application. The application has ten modules, such as profile, learning module, quests module, Avatar, Rewards, Levels, Progress Bars, Leaderboards, Data Center, and feedback.

Profile Module. This module refers to the profile of the users. It included the full name, section, school, and gender. The users were able to update their profiles using this module.

Game Mechanics. The application was named CSS Quest. The game mechanics were the sets of COC

(Certificate of Competency) modules that the students should complete. There was self-assessment, pre-test, COC1: INSTALL AND CONFIGURE COMPUTER SYSTEMS, COC2: SET-UP COMPUTER NETWORKS, COC3: SET-UP COMPUTER SERVERS, COC4: MAINTAIN AND REPAIR COMPUTER SYSTEM AND NETWORKS, and Post-test in the application. The content of the assessments is all based on the TESDA Manual for Computer Systems Servicing.

Quests Module. Refers to a set of challenges or tasks that a player needs to complete in order to progress through this game or achieve a specific goal. Quest modules are designed to create a sense of purpose and direction for players, and to provide them with a sense of accomplishment and reward when they successfully complete each task. This is where the player earns points.

Visual Aesthetic Design. Most of the images and other designs were created or edited through an editor tool such as Canva and Photoshop. For the GUI of the mobile application, most of the background was classrooms and computer data centers.

Narrative Design. The system provided the storyline and the mission the students needed to accomplish. The CSS Instructor are communicating with students through this.

Levels. The levels were composed of Newbie, Intermediate, and Skillful. The user would start as the Newbie. The rank of the student would go up once a student completed a task.

Leaderboards. The leaderboard showed all the students in the system. This included the names, courses, and progress.

Feedback. For the normal tasks, the players would get immediate feedback like for example, after clicking an answer would show if it is correct or wrong. For both tasks, they would see the result and answers (students' answers and the correct answer if the answer was wrong).

Points. Points would be earned by answering the tasks. One point per right answer was the rule of the game. This was added to the progress of the students once the task was completed and submitted.

Data Center. Data Center is where the player can see his/her scores and progress in the game.

Implementation

In this phase, the development of the system began. The gathered and organized data, algorithms, and techniques were considered. The design of the system was implemented. The gamification technique was applied to the application. The system will be released to the intended users, the Grade 12 students. Training sessions will be conducted for teachers and students to ensure they can use the system effectively. The system will be monitored to ensure it is working correctly and meeting the needs of the users.

Deployment

The CSS Quest will be used for Senior High School in Calamba who will take the TESDA skill assessment for A.Y. 2022-2023.

IV. Results and Discussion

RESEARCH OBJECTIVE 1: To design and implement an innovative mobile application that leverages cutting-edge game mechanics, gamification strategies, and cognitive learning principles to create an engaging and effective CSS module reviewer platform for senior high school students, with the aim of enhancing their learning experience and improving their retention of CSS concepts.

CSS Quest

The mobile application has the following modules: the profile, newsfeed, scheduling, tasks, quests, and leaderboard.

Figure 6. CSS Quest Front Page

Profile Module. This module refers to the profile of the users. It included the full name, section, school, and gender.

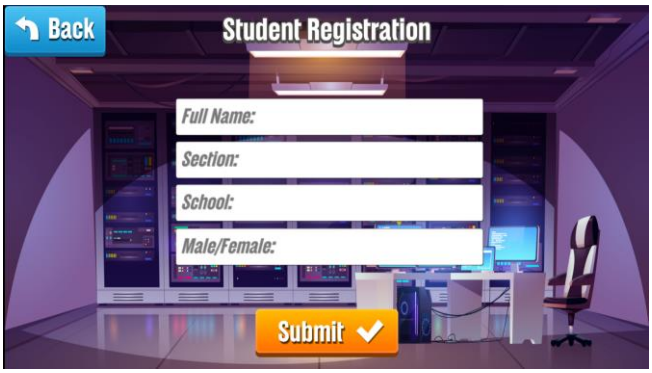

Figure 7. Profile Module Design

Game Mechanics. The application was named CSS Quest. The game mechanics were the sets of COC (Certificate of Competency) modules that the students should complete. The content of the module are the following:

Self-Assessment

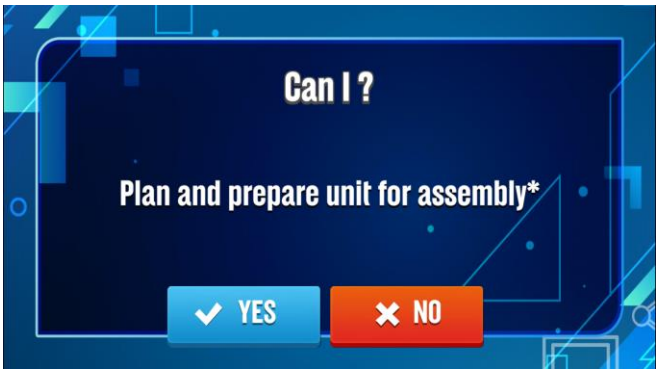

Figure 8. Self-Assessment Guide

Pre-Test

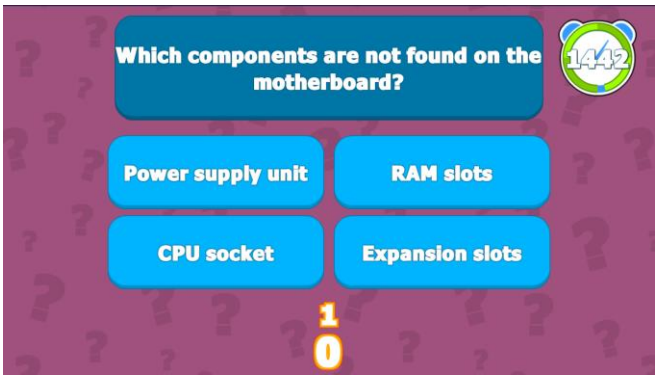

Figure 9. Pre-Test Module

COC1: INSTALL AND CONFIGURE COMPUTER SYSTEMS
COC1-LO1: Assemble Computer Hardware
COC1-LO2: Prepare Installer
COC1-LO3: Install Operating System and Drivers
COC1-LO4: Install application Software
COC1-LO5: Conduct testing and documentation

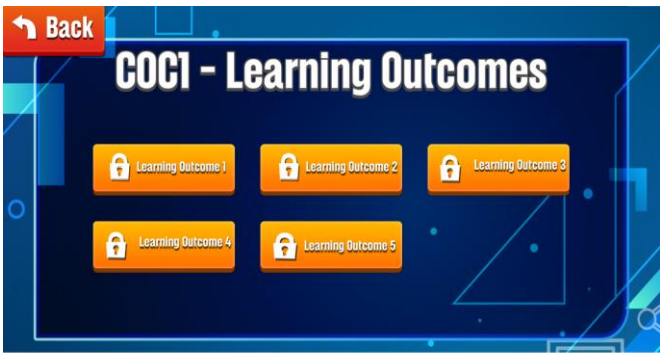

Figure 10. COC1 Module

COC2: SET-UP COMPUTER NETWORKS
COC2-LO1: Network Cable
COC2-LO2: Computer Networks
COC2-LO3: Router Configuration

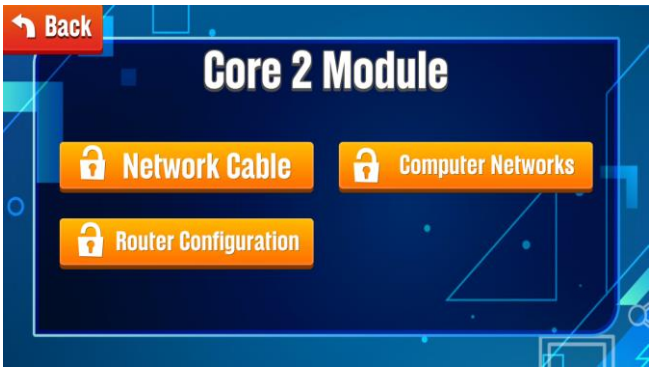

Figure 11. COC2 Module

COC3: SET-UP COMPUTER SERVERS
COC3-LO1: Server Installation or Configuration
COC3-LO2: Client Configuration
COC3-LO3: Domain Connection
COC3-LO4: Dynamic Host Configuration Protocol
COC3-LO5: Folder Redirection
COC3-LO6: Printer Deployment
COC3-LO7: Remote Desktop

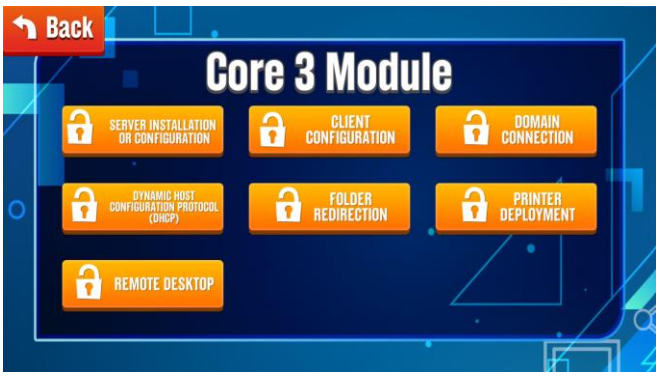

Figure 12. COC3 Module

COC4: MAINTAIN AND REPAIR COMPUTER SYSTEM AND NETWORKS
COC4-LO1: Client Backup Demoting
COC4-LO2: Server Backup Demoting

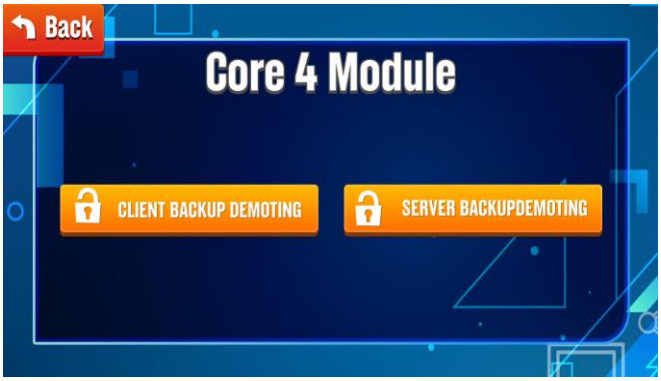

Figure 13. COC4 Module

The content of the assessments is all based on the TESDA Manual for Computer Systems Servicing.

Quests Module. Refers to a set of challenges or tasks that a player needs to complete in order to progress

through this game or achieve a specific goal. Quest modules are designed to create a sense of purpose and direction for players, and to provide them with a sense of accomplishment and reward when they successfully complete each task. This is where the player earns points.

Figure 14. Quests Module

Visual Aesthetic Design. Most of the images and other designs were created or edited through an editor tool such as Canva and Photoshop. For the GUI of the mobile application, most of the background was classrooms and computer data centers.

Figure 15. Visual Aesthetic Design

Narrative Design. The system provided the storyline and the mission the students needed to accomplish. The CSS Instructor are communicating with students through this.

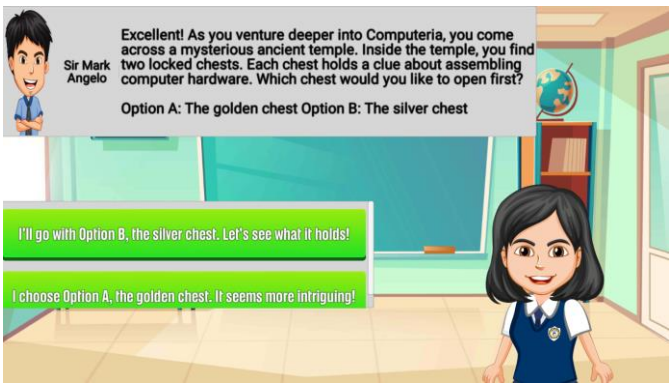

Figure 16. Narrative Design

Levels. The levels were composed of Newbie, Intermediate, and Skillful. The user would start as the Newbie. The rank of the student would go up once a student completed a task.

Leaderboards. The leaderboard showed all the students in the system. This included the names, courses, and progress.

Feedback. For the normal tasks, the players would get immediate feedback like for example, after clicking an answer would show if it is correct or wrong. For both tasks, they would see the result and answers (students' answers and the correct answer if the answer was wrong).

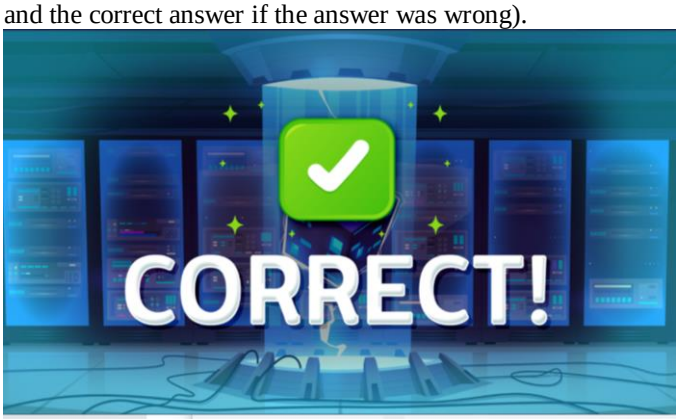

Figure 17. Feedback

Points. Points would be earned by answering the tasks. One point per right answer was the rule of the game. This was added to the progress of the students once the task was completed and submitted.

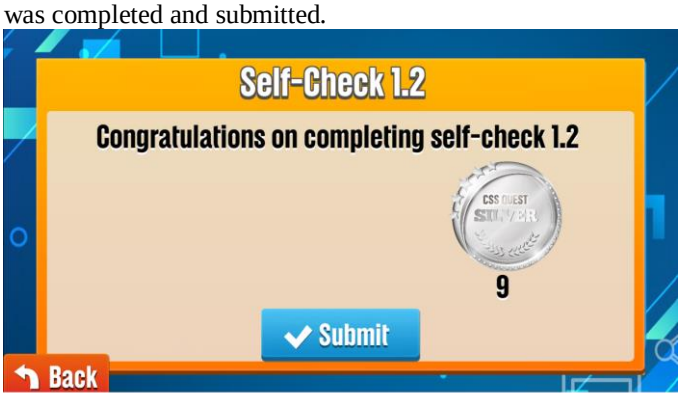

Figure 18. Points

Data Center. Data Center is where the player can see his/her scores and progress in the game.

Figure 19. Data Center

RESEARCH OBJECTIVE 2: To utilize gamified progress tracking algorithms and interactive storytelling algorithms approach in designing Computer System Servicing reviewer applications for senior high school students.

The Gamified Progress Tracking Algorithm and Interactive Storytelling Algorithm for CSS Quest is designed to enhance the learning experience of Grade 12 students in Calamba City, Laguna, within the Computer System Servicing (CSS) module. This algorithm incorporates gamification elements to track students' progress, engage them in a captivating narrative, and promote active learning throughout the module.

Gamified Progress Tracking Algorithm for CSS Quest

Algorithm Steps:

Quest Selection and Avatar Creation:

a. Students choose a CSS quest from a selection of available options.

b. Students create their virtual avatars to represent themselves throughout the quest.

Pre-Quest Assessment:

a. Students complete a pre-quest assessment to evaluate their existing knowledge and skills related to the CSS module.

b. Based on the assessment results, the algorithm adapts the difficulty level of the quest to match students' proficiency.

Quest Progression:

a. Students embark on the quest, which consists of different levels or stages.

b. Each level focuses on specific learning objectives and concepts from the CSS module.

c. Students complete tasks, solve problems, and answer questions aligned with the learning objectives of each level.

d. The algorithm tracks their progress and awards experience points (XP) for successful completion of each level.

XP Accumulation and Leveling:

a. As students accumulate XP, they level up, unlocking new features, rewards, and content within the CSS quest.

b. Higher levels introduce more challenging tasks, advanced concepts, and additional learning resources.

Gamified Progress Indicators:

a. The algorithm visually represents students' progress through indicators such as a progress bar, achievements, or badges.

b. Milestones or significant accomplishments are celebrated with virtual rewards, recognition, or unlocking of special features.

Interactive Storytelling:

a. The algorithm incorporates an engaging storyline that unfolds as students progress through the quest.

b. Characters, quests, and challenges within the narrative are designed to immerse students and sustain their interest.

Formative Feedback and Support:

a. Students receive timely feedback on their performance in each quest level, helping them identify strengths and areas for improvement.

b. The algorithm offers hints, additional resources, or access to tutorials to support students facing challenges.

Post-Quest Assessment and Reflection:

a. Upon completing the CSS quest, students undergo a post-quest assessment to evaluate their overall understanding and retention of the module's concepts.

b. Students are encouraged to reflect on their learning experience and provide feedback on the gamified progress-tracking approach.

The Gamified Progress Tracking Algorithm for CSS Quest provides a comprehensive framework to gamify the Computer System Servicing module for Grade 12 students in Calamba City, Laguna. By integrating gamification elements, interactive storytelling, and progress tracking, this algorithm aims to foster active learning, motivation, and knowledge acquisition within the CSS quest.

RESEARCH OBJECTIVE 3: To evaluate the usability and user experience of a gamified CSS reviewer mobile application among senior high school students by using the evaluation instruments of i-LETyouReview of (De Jesus, 2021) which has the criteria such as Enjoyment, Engagement, Motivation, and System Usability.

According to Mullins and Sabherwal (2018), it is essential for the gamified experience to be enjoyable. The participants strongly expressed their agreement that they had a fun time while using the gamified application. They disagreed when asked if they felt exhausted while using the application. In cases where there was some ambiguity regarding the participants' feelings of enjoyment, it was observed that the majority experienced some level of enjoyment, while a small percentage did not specifically enjoy the activity. This supports the claim made by Bailey, Pritchard, and Kernohan (2015) that an enjoyable gamified experience leads to increased student engagement.

The participants strongly agreed that they felt challenged and engaged while using the gamified learning activity. They disagreed with feeling bored during the activity and reported that time passed quickly. Additionally, they disagreed with the statement that they did not care about how the game ended. These findings suggest that the participants were satisfied and engaged, as interpreted by Suh, Wagner, and Liu (2018).

The research also indicated that gamified learning scenarios can enhance students' motivation, which in turn affects their academic performance (Afzal, Ali, Khan, Hamid, 2010). The participants agreed that doing well in the task was important to them and strongly agreed that the activity was interesting. They disagreed with the statement that they did not put much effort into doing well in the activity.

Regarding the system's usability, the participants agreed that they would like to use the gamified application frequently due to its ease of use and integration of various functions. They also expressed confidence in using the system, believing that most people would quickly learn how to use it. However, the participants were undecided about the system's complexity, the need for technical assistance, system inconsistency, its cumbersome nature, and the requirement to learn a lot before using the system. This ambiguity may be attributed to the clarity of instructions provided. A possible solution suggested by Dunham, Lee, and Persky (2020) is to offer concise instructions written in student-friendly language and presented in sequential order of operation.

Table 1. Evaluation results of the students

Criteria	Weighted Mean	Verbal Interpretation	Rank
Enjoyment			
1. I feel genuinely fun.	4.32	Strongly Agree	2
2. I feel happy when playing the game.	4.37	Strongly Agree	1
3. I feel that it is great for killing time productively.	4.05	Agree	3
4. I feel exhausted when playing it.	2.37	Disagree	4
5. I feel miserable when playing it.	1.82	Disagree	5
Engagement			
1. I wanted to explore all the options because it was very challenging.	4.68	Strongly Agree	1
2. I felt that time passed quickly.	4.11	Agree	3
3. I wanted to complete the game.	4.29	Strongly Agree	2
4. I did not care how the game ended.	2.45	Disagree	4
5. I feel bored when playing it.	1.71	Strongly Disagree	5
Motivation			
1. It was important to me to do well at this task.	4.63	Strongly Agree	1
2. I would describe this activity as very interesting.	4.53	Strongly Agree	2
3. I tried very hard on this activity.	3.74	Agree	3
4. I didn't try very hard to do well at this activity.	2.29	Disagree	4
5. I didn't put much energy into this.	2.32	Disagree	5
System Usability			
1. I think that I would like to use this system frequently.	4.32	Strongly Agree	3
2. I found the system unnecessarily complex.	3.11	Undecided	9
3. I thought the system was easy to use.	3.63	Agree	6
4. I think that I would need the support of a technical person to be able to use this system.	3.16	Undecided	7
5. I found the various functions in this system were well integrated.	4.39	Strongly Agree	2
6. I thought there was too much inconsistency in this system.	3.13	Undecided	8
7. I would imagine that most people would learn to use this system very quickly.	4.42	Strongly Agree	1
8. I found the system very cumbersome to use.	3.11	Undecided	9
9. I felt very confident using the system.	4.00	Agree	4
10. I needed to learn a lot of things before I could get going with this system.	3.76	Agree	5

Legend: *4.21 -5.00 Acceptable 3.401 – 4.20 Slightly Acceptable 2.61 – 3.40 Undecided 1.80 – 2.59 Slightly unacceptable 1.00 – 1.79 Unacceptable*

Tesda Coordinators, CSS Instructors and IT Expert

Table 8 shows the acceptability of the system in terms of the TESDA coordinators, CSS Instructors and IT Experts as respondents. The TESDA coordinators, CSS Instructors and IT experts which are composed of senior programmers in different software companies rated the system as acceptable in all of the 10 criteria.

The system is said to be easily learned and simple to use. The information provided by the system is easy to find and they can improve their productivity with the system. They accepted that interface of the system is pleasant and they are comfortable in using the system. Thus, it is said that they are overall satisfied with the system.

Criteria	TESDA COORDINATOR & INSTRUCTOR			IT EXPERT		
	Weighted Mean	Verbal Interpretation	Rank	Weighted Mean	Verbal Interpretation	Rank
1. The system is simple to use.	4.6	Acceptable	2	4.4	Acceptable	3
2. I feel comfortable in using the system.	4.6	Acceptable	2	4.4	Acceptable	3
3. The system is easy to learn.	4.6	Acceptable	2	4.4	Acceptable	3
4. I believe I can be productive using this system.	4.4	Acceptable	3	4.4	Acceptable	3
5. The information provided for the system is easy to understand.	4.6	Acceptable	2	4.4	Acceptable	3.5
6. It is easy to find the information needed.	4.8	Acceptable	1	4.4	Acceptable	3
7. The interface of this system is pleasant.	4.6	Acceptable	2	4.8	Acceptable	1
8. I like using the interface of this system.	4.4	Acceptable	3	4.4	Acceptable	3
9. The system has all the functions and capabilities I expect to have.	4.8	Acceptable	1	4.2	Acceptable	4
10. Overall, I am satisfied with the system.	4.8	Acceptable	1	4.6	Acceptable	2

Legend: *4.21 -5.00 Acceptable 3.401 – 4.20 Slightly Acceptable 2.61 – 3.40 Undecided 1.80 – 2.59 Slightly unacceptable 1.00 – 1.79 Unacceptable*

Table 2. Acceptability of the system for TESDA coordinators, CSS Instructors and IT experts

During the evaluation discussion, all the results obtained were accepted based on the following criteria:

The system is simple to use: The TESDA Coordinators, CSS Instructors and IT Experts found the system to be straightforward and user-friendly, requiring minimal effort to navigate and operate. They are feeling at ease while using the system, without any significant discomfort or uneasiness. It is found the system to have a short learning curve, enabling them to grasp its functionalities quickly and efficiently. Users expressed confidence in their ability to accomplish tasks and be productive while utilizing the system. Users found the information related to the system to be clear, concise, and easily comprehensible, facilitating their understanding and usage. They experienced no difficulty in locating the required information within the system, as the organization and search capabilities were deemed effective and efficient. They found the system's interface visually appealing and aesthetically pleasing, contributing to an overall positive user experience. They expressed a preference for the system's interface, indicating a high level of satisfaction and enjoyment while interacting with it. They confirmed that the system fulfilled their expectations by providing all the necessary features and functionalities they anticipated.

Overall, Evaluators expressed overall satisfaction with the system, taking into account all the aforementioned criteria and their experience as a whole.

Based on these evaluations, it can be concluded that the system successfully met the evaluators' expectations and

received positive feedback regarding its ease of use, comfort, learnability, productivity, clarity of information, findability, interface design, presence of expected functions, and overall user satisfaction.

RESEARCH OBJECTIVE 4: To evaluate the impact of gamification on student performance by comparing the assessment (pre-test and post-test) scores of students who participated in the gamification system with those who did not.

Pre-Test and Post-Test Result

The pre-test and post-test results of the CSS Quest module using the Gamified Progress Tracking and Interactive Storytelling Algorithm for Grade 12 students in Calamba City, Laguna, provide valuable insights into the effectiveness of the module in improving students' knowledge and skills in computer system servicing.

Pre-Test

Before starting the module, students are given a pre-test which has 25 multiple choice questions per COC (Certificate of Competency) which has a total of 100 multiple questions. This is to assess their baseline understanding of the subject matter. The numbers of students who took the Pre-test were 44 students. The highest score in pre-test was 57 and the lowest score was 5. The pre-test evaluates their knowledge of computer system servicing concepts, troubleshooting techniques, hardware and software components, and other relevant topics. The results of the pre-test serve as a benchmark to measure the progress and learning outcomes achieved by the students after completing the module. The student's learning achievement in pretest was presented in Table 16.

Table 3. Students' learning achievement before using the CSS Quest. (Pre-Test)

No.	Students	Score of Pre-Test
1	M.B.	34
2	E. M.	37
3	K. F.	43
4	J.P.	32
5	M.M.	39
6	F.M	31
7	M.A.	44
8	J.M.	40
9	M.J.	57
10	R.D.	37
11	A.A.	31
12	E.N.	5
13	K.P.	26
14	A.P.	48
15	P.R.	33
16	J.B.	39
17	R.S.	48
18	P.A.	29
19	A.P	43
20	J.F.	34
21	M.M.	30
22	R.T.	17
23	P.A.	30
24	J.C.	53
25	C.A.	44
26	N.Q.	42
27	Y.C.	46
28	D.P	45
29	J.M.	48
30	C.S.	39
31	M.V.	32
32	J.G.	40
33	L.D.	49
34	T.H.	41
35	J.T.	40
36	R.O.	48
37	M.C.	55
38	P.N.	39
39	J.B.	38
40	T.D.	42
41	J.S.	22
42	M.C.	31
43	J.M.	42
44	D.M.	56

The data of students' pre-test, then were arranged in the form of frequency and percentages through score's criteria, as they were presented in the following table:

Table 4. The Percentage of Students' learning achievement before using the CSS Quest.

Grade	Criteria of Score	Frequency(f)	Percentage(p)
A	91-100	-	-
B	81-90	-	-
C	71-80	-	-
D	61-70	-	-
E	41-60	19	43%
F	0-40	25	57%
		$\sum f = 44$	$\sum p$ 100%

Based on the table of percentages and criteria above, the students' scores in the pretest were presented as follows:

Table 5. The Score's Criteria of the students learning achievement before using the CSS Quest.

No.	Score's Criteria	Grade	Percentage(p)
1	91-100	A	Excellent
2	81-90	B	Very Good
3	71-80	C	Good
4	61-70	D	Average
5	41-60	E	Poor
6	0-40	F	Very Poor
7	91-100	A	Excellent

From the criteria above, it can be concluded that the student's achievement before using the CSS Quest. There were 43% with poor criteria where the students got a score range from 41-60 with a grade of E and 57% with very poor criteria where the students only got a score range from to 0-40 with a grade of F. From the table above, the majority of the students still got very poor score. Meanwhile, the descriptive statistic of the pretest which consisted of mean, median, and mode were presented below:

Table 6. Descriptive Statistic of Pre-test Score

Pre-Test

N	Valid	44
	Missing	0
	Mean	38.61364
	Median	39

The table above showed that there were 44 test takers. The means score was 38.61. The mean 38.61 meant that the average of 44 students score 38.61. So, the student's score 38.61 was average score. Since there is an even number of scores, the median is the average of the two middle numbers which are 38 and 40, so the median was 39 and the mode was 39 and 48.

The frequency of pretest consisted of score, frequency, percent, valid percent, and cumulative percent were presented below:

Table 7. Frequency of Pre-Test

Score	Frequency	Percent	Valid Percent	Cumulative Percent
5	1	2.3	2.3	2.3
17	1	2.3	2.3	4.5
22	1	2.3	2.3	6.8
26	1	2.3	2.3	9.1
29	1	2.3	2.3	11.4
30	2	4.5	4.5	15.9
31	3	6.8	6.8	22.7
32	2	4.5	4.5	27.3
33	1	2.3	2.3	29.5
34	2	4.5	4.5	34.1
37	2	4.5	4.5	38.6
38	1	2.3	2.3	40.9
39	4	9.1	9.1	50.0
40	3	6.8	6.8	56.8
41	1	2.3	2.3	59.1
42	3	6.8	6.8	65.9
43	2	4.5	4.5	70.5
44	2	4.5	4.5	75.0
45	1	2.3	2.3	77.3
46	1	2.3	2.3	79.5
48	4	9.1	9.1	88.6
49	1	2.3	2.3	90.9
53	1	2.3	2.3	93.2
55	1	2.3	2.3	95.5
56	1	2.3	2.3	97.7
57	1	2.3	2.3	100.0
TOTAL	**44**	**100.0**	**100.0**	

The table showed that mean score was 38.61, it meant that the average of 44 students score 38.61. The median score was 39. In the data score (score 5-57) the median was 39. The mode score was 39 and 48. The frequency of pretest after it was distributed there were 25 students (56.8%) got score between 0- 40, it meant that on the students' students learning achievement was very poor and 19 students (43.2%) got score between 41-60, it showed that the students' learning achievement score was poor. This means that the students lack knowledge in Computer System Servicing.

Post-Test

After engaging with the gamified learning experience and interactive storytelling activities within the CSS Quest module, students undergo a post-test to evaluate their knowledge and skills acquired throughout the learning journey. The post-test are the same with the pre-test questionnaires. It was given to the same 44 students.

The student's learning achievement in post-test was presented in Table 8.

Table 8. Students' learning achievement after using the CSS Quest. (Post-Test)

No.	Students	Score of Post-Test
1	M.B.	82
2	E. M.	88
3	K. F.	88
4	J.P.	86
5	M.M.	80
6	F.M	76
7	M.A.	90
8	J.M.	70
9	M.J.	98
10	R.D.	72
11	A.A.	68
12	E.N.	48
13	K.P.	65
14	A.P.	90
15	P.R.	90
16	J.B.	76
17	R.S.	89
18	P.A.	53
19	A.P	86
20	J.F.	86
21	M.M.	63
22	R.T.	50
23	P.A.	52
24	J.C.	98
25	C.A.	85
26	N.Q.	80
27	Y.C.	82
28	D.P	84
29	J.M.	86
30	C.S.	89
31	M.V.	67
32	J.G.	62
33	L.D.	94
34	T.H.	82
35	J.T.	76
36	R.O.	90
37	M.C.	92
38	P.N.	80
39	J.B.	73
40	T.D.	92
41	J.S.	60
42	M.C.	82
43	J.M.	88
44	D.M.	96

The data of students' post-test, then were arranged in the form of frequency and percentages through score's criteria, as it was presented in the following table:

Table 9. The Percentage of Students' learning achievement after using the CSS Quest.

Grade	Criteria of Score	Frequency(f)	Percentage(p)
A	91-100	6	14%
B	81-90	19	43%
C	71-80	8	18%
D	61-70	6	14%
E	41-60	5	11%
F	0-40	-	-
		$\sum f = 44$	$\sum p$ 100%

Based on the table of percentage and criteria above, the students' scores in the post-test were presented as follows:

Table 10. The Score's Criteria of the students learning achievement after using the CSS Quest.

No.	Score's Criteria	Grade	Percentage(p)
1	91-100	A	Excellent
2	81-90	B	Very Good
3	71-80	C	Good
4	61-70	D	Average
5	41-60	E	Poor
6	0-40	F	Very Poor

From the criteria above, it can be concluded that the students' achievement after using the CSS Quest. There were 14% with Excellent score where the students got score range from to 91-100 with grade A. Meanwhile, there 43% with Very good criteria where the students got score range from to 81-90 with grade B. The table also showed that there were 18% with good criteria where the students got score range from to 71-80 with grade C. On the other hand, there were 14% with average criteria where the students got score range from to 61-70 with grade D. Finally, 11% with poor criteria where the students only got score range from to 41-60 with grade E. From the table above, the majority of the students got score 81-90. Meanwhile, the descriptive statistic of posttest which consist of mean, median, and mode were presented as below:

Table 11. Descriptive Statistic of Post-test Score

		Post-Test
N	Valid	44
	Missing	0
	Mean	79.1818
	Median	82

The table above shows that there were 44 test takers. The means score was 79.1818. The mean 79.1818 meant that the average of 44 students score 79.1818. So, the student's score

79.1818 was average score. Meanwhile, the median was 82 and the mode was 82, 86 and 90.

The frequency of pretest consists of score, frequency, percent, valid percent, and cumulative percent are presented below:

Table 12. Frequency of Post-Test

Score	Frequency	Percent	Valid Percent	Cumulative Percent
48	1	2.3	2.3	2.3
50	1	2.3	2.3	4.5
52	1	2.3	2.3	6.8
53	1	2.3	2.3	9.1
60	1	2.3	2.3	11.4
62	1	2.3	2.3	13.6
63	1	2.3	2.3	15.9
65	1	2.3	2.3	18.2
67	1	2.3	2.3	20.5
68	1	2.3	2.3	22.7
70	1	2.3	2.3	25.0
72	1	2.3	2.3	27.3
73	1	2.3	2.3	29.5
76	3	6.8	6.8	36.4
80	3	6.8	6.8	43.2
82	4	9.1	9.1	52.3
84	1	2.3	2.3	54.5
85	1	2.3	2.3	56.8
86	4	9.1	9.1	65.9
88	3	6.8	6.8	72.7
89	2	4.5	4.5	77.3
90	4	9.1	9.1	86.4
92	2	4.5	4.5	90.9
94	1	2.3	2.3	93.2
96	1	2.3	2.3	95.5
98	2	4.5	4.5	100.0
TOTAL	**44**	**100.0**	**100.0**	

The table shows that mean score was 79.2, it means that the average of 44 students score 79.2. The median score is 82. In the data score (score 48-98) the median was 82. The mode score 82, 86 and 90. The frequency of post-test after it was distributed, there was 5 students (11%) got score between 41-60, it means that on the students' learning achievement was poor, 6 students (14%) got score between 61-70, it showed that the students' learning achievement score was average, 8 students (18%) got score between 71-80, it means that the students' learning achievement was good, 19 students (43%) got score between 81-90, it means that the students' learning achievement was very good, and there were 6 students (14%) got score between 91-100, it means that the students' learning achievement was excellent. The post-test measures the students' comprehension of the key concepts covered in the module, their ability to apply problem-solving techniques, and their proficiency in computer system servicing tasks.

The result of both Pre-test and Post-test of one group experimental are presented as below:

Table 13. The Result of Pre-test and Post-test

No.	Students	Score of Pre-Test	Score of Post-Test
1	M.B.	34	82
2	E. M.	37	88
3	K. F.	43	88
4	J.P.	32	86
5	M.M.	39	80
6	F.M	31	76
7	M.A.	44	90
8	J.M.	40	70
9	M.J.	57	98
10	R.D.	37	72
11	A.A.	31	68
12	E.N.	5	48
13	K.P.	26	65
14	A.P.	48	90
15	P.R.	33	90
16	J.B.	39	76
17	R.S.	48	89
18	P.A.	29	53
19	A.P	43	86
20	J.F.	34	86
21	M.M.	30	63
22	R.T.	17	50
23	P.A.	30	52
24	J.C.	53	98
25	C.A.	44	85
26	N.Q.	42	80
27	Y.C.	46	82
28	D.P	45	84
29	J.M.	48	86
30	C.S.	39	89
31	M.V.	32	67
32	J.G.	40	62
33	L.D.	49	94
34	T.H.	41	82
35	J.T.	40	76
36	R.O.	48	90
37	M.C.	55	92
38	P.N.	39	80
39	J.B.	38	73
40	T.D.	42	92
41	J.S.	22	60
42	M.C.	31	82
43	J.M.	42	88
44	D.M.	56	96

Based on the table above, there were 44 students as the sample of the research. The test was conducted by the researcher before and after implementing CSS Quest. The researcher used statistical test with paired sample t-test stated by SPSS to convince of pre-test and post-test of the

effectiveness of using CSS Quest on the students' CSS learning achievement. The result is as follows:

Table 14. Paired Sample Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair1	PRE	38.61364	44	10.148240560282	1.5299048282146
POST		79.1818	44	13.261717464405	1.9992791320516

The table above shows that the mean score of pretest is 38.61364, while N for cell there was 44. Meanwhile, standard deviation for pretest is (10.15). Mean standard error for pretest was (1.530). Thus, the mean score of posttest is 79.18, while N for cell there was 44. Meanwhile, standard deviation for pretest was (13.262). Mean standard error for pretest is (1.999).

Table 15. Paired Sample Correlation

		N	Correlation	Sig.
Pair 1	PRE& POST	44	.814	<.001

The table of paired sample correlation above showed that the large correlation between samples, the numeral of both correlation was (0.814) and numeral significance was (<.001).

Table 16. Paired Sample Test

Paired Differences						t	df	Sig (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% confidence Interval of the Differences				
			Lower	Upper				
Pair 1 Pre-Post	-40.56818	7.73815	1.16657	-42.92079	-38.21557	-34.776	43	<.001

The table above shows the result of analysis using T-test. The mean difference pre-test and post-test was (-40.56818), standard deviation is (7.73815), mean standard error is (1.16657). The lower different was (-42.92079), while the upper different is (-38.21557) The result test t = (-7,700) with df 43 and significance <.001. The probability value is <.001 which less than the level of significance at .05. Thus reject the null hypothesis. It can be concluded that there is significant difference on the performance in the pretest and post-test. It implies that the proposed material is effective

2) Based on the large of digit significant. In this case decision taken from
the following consideration:
a. If probability > 0.05 then hypothesis null was accepted
b. If probability < 0.05 then hypothesis null was rejected
With the numeral of significant value 0.000 < than significant level 0.05, then the hypothesis null stated that there is no significant different score by using CSS Quest application on the students' learning achievement at the grade 12 senior high school of LCBA and CVLIS was rejected.

V. SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study aimed to enhance student engagement, motivation, and learning outcomes through the integration of gamification elements, progress tracking, and an interactive storytelling algorithm.

The CSS Quest was built using Unity application for the students who will take the Computer System Servicing assessment in TESDA. The content of gamified application was made with the four COC included in the Computer System Servicing Assessment Guide. The application has ten modules, such as profile, learning module, quests module, Avatar, Rewards, Levels, Progress Bars, Leaderboards, Data Center, and feedback. The researcher integrates Gamified Tracking algorithm and Interactive algorithm in the mobile application.

Conclusions

In conclusion, this research project aimed to design and implement an innovative mobile application that incorporates cutting-edge game mechanics, gamification strategies, and cognitive learning principles to enhance the learning experience and improve retention of Computer System Servicing (CSS) concepts among senior high school students.

The researcher arrives with the following conclusions based on the research objectives:

1. The research successfully designed and implemented an innovative mobile application that served as a CSS module reviewer platform. By leveraging game mechanics, gamification strategies, and cognitive learning principles, the application aimed to create an engaging and effective learning experience for senior high school students.

2. The gamified progress tracking algorithms and interactive storytelling algorithms approach were utilized in the design of the CSS reviewer applications. These elements were integrated to enhance user engagement, motivation, and understanding of CSS concepts.

3. The usability and user experience of the gamified CSS reviewer mobile application were evaluated among senior high school students. Based on the evaluation of the students, they enjoyed, were engaged, and motivated in using the gamified application. Students agree that the gamified application is useful in their CSS Assessment. On the other hand Program Coordinators, CSS Instructors and IT Expert unanimously agree that the CSS Quest application is acceptable in all the

criteria and overall they are satisfied on the application.

4. The impact of gamification on student performance was assessed by comparing the assessment scores (pre-test and post-test) of students who participated in the gamification system. This comparison aimed to measure the effectiveness of the gamified approach in improving student performance and understanding of CSS concepts. Based on the result the score on the post – test improve after the students used the CSS Quest application compare to the pre-test.

Overall, this research project has contributed to the field of education technology by exploring the potential of gamification and mobile applications in enhancing the learning experience for senior high school students studying CSS. The findings from the usability evaluation and performance assessment will provide valuable insights into the effectiveness and impact of gamification on student learning outcomes. Moving forward, it is recommended to further refine and improve the mobile application based on the feedback received during the usability evaluation. Additionally, conducting long-term studies to assess the sustainability and long-lasting impact of gamification on student motivation and performance would be beneficial. This research project sets the foundation for future research and development in the gamification of educational modules, opening doors to innovative and engaging learning approaches for students.

Recommendation

For future researchers, the proponent is recommending the following:

1. The system's adaptability to changes, such as additional majors or updates on majors.
2. Design an intuitive and visually appealing user interface (UI) that aligns with the gamified elements and interactive storytelling approach. Focus on creating a seamless and engaging user experience (UX) to captivate and retain the attention of Grade 12 students.
3. Make it more compatible with different mobile operating systems like iOS.
4. Implement robust security measures to protect user data and ensure privacy. Adhere to relevant data protection regulations and guidelines to maintain the trust and confidence of users.
5. Check the possibility of this research on becoming an income generation project.
6. Make this application available in the Google Play store and IOS Store.

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