UNIVERSITI TEKNOLOGI MARA
Cawangan Melaka

PCMJ

Progress in Computing and Mathematics Journal

volume 1

https://fskmjebat.uitm.edu.my/pcmj/

Progress in Computing and Mathematics Journal
College of Computing, Informatics, and Mathematics
Universiti Teknologi MARA Cawangan Melaka, Kampus Jasin
77300, Merlimau, Melaka Bandaraya Bersejarah

PCMJ

Progress in Computing and Mathematics Journal

volume 1

Progress in Computing and Mathematics Journal (PCMJ)
College of Computing, Informatics, and Mathematics
Universiti Teknologi MARA Cawangan Melaka, Kampus Jasin
77300, Merlimau, Melaka Bandaraya Bersejarah

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior permission.

EDITORS

Ahmad Firdaus Ahmad Fadzil
Khyrina Airin Fariza Abu Samah
Raihana Md Saidi
Shahadan Saad
Sheik Badrul Hisham Jamil Azhar
Zainal Fikri Zamzuri
Siti Feirusz Ahmad Fesol
Salehah Hamzah
Raseeda Hamzah
Mohamad Asrol Arshad
Mohd Hafifi Mohd Supir
Nurul Hidayah Mat Zain
Syamsul Ariffin Yahaya
Edzreena Edza Odzaly

PCMJ
Progress in Computing and Mathematics Journal
volume 1

PREFACE

Welcome to the inaugural volume of the **Progress in Computing and Mathematics Journal (PCMJ)**, a publication proudly presented by the College of Computing, Informatics, and Mathematics at UiTM Cawangan Melaka.

This journal represents a significant step in our commitment to fostering a vibrant research culture, initially providing a crucial platform for our undergraduate students to showcase their intellectual curiosity, dedication to scholarly pursuit, and potential to contribute to the broader academic discourse in the fields of computing and mathematics. However, we envision PCMJ evolving into a beacon for researchers both nationally and internationally. We aspire to cultivate a space where groundbreaking research and innovative ideas converge, fostering collaboration and intellectual exchange among established scholars and emerging talents alike.

The manuscripts featured in this first volume, predominantly authored by our undergraduate students, are a testament to the hard work and dedication of these budding researchers, as well as the guidance and support provided by their faculty mentors. They cover a diverse range of topics, reflecting the breadth and depth of research interests within our college, and set the stage for the high-quality scholarship we aim to attract in future volumes.

As editors, we are honored to have played a role in bringing this journal to fruition. We extend our sincere gratitude to all the authors, reviewers, and members of the editorial board for their invaluable contributions. We also acknowledge the unwavering support of the college administration in making this initiative possible.

We hope that PCMJ will inspire future generations of students and researchers to embrace research and innovation, to push the boundaries of knowledge, and to make their mark on the world of computing and mathematics.

Editors
Progress in Computing and Mathematics Journal (PCMJ)
College of Computing, Informatics, and Mathematics
UiTM Cawangan Melaka

TABLE OF CONTENTS

LIST OF EDITORS ..... **iii**

PREFACE ..... **iv**

TABLE OF CONTENTS ..... **v**

SIMPLIFIED DRONE GAME FOR INITIAL REMEDIAL INTERVENTION FOR DYSPRAXIA AMONG KIDS 1

DEVELOPMENT OF STORAGE BOX WITH AUTOMATED AND REMOTE LOCK CONTROL SYSTEM IN WLAN ENVIRONMENT 16

COMPARATIVE ANALYSIS OF PASSWORD CRACKING TOOLS 29

SPORT FACILITIES FINDER USING GEOLOCATION 50

READ EASY AR: INTERACTIVE STORYBOOK FOR SLOW LEARNER 60

MATHMINDSET: GAME-BASED LEARNING TO REDUCE MATH ANXIETY 87

NETWORK PERFORMANCE ANALYSIS ON DIFFERENT ISP USING ONLINE CLASS PLATFORM ON DIFFERENT DEVICES 101

CIVIC HEROES; ENHANCING CIVIC AWARENESS THROUGH GAME-BASED LEARNING 115

ENHANCING COMMUNITY SQL INJECTION RULE IN INTRUSION DETECTION SYSTEM USING SNORT WITH EMAIL NOTIFICATIONS 124

LEARNING ABOUT MALAYSIA THROUGH GAME 138

STUDENT CHATROOM WITH PROFANITY FILTERING 150

ARCHITECTURE BBUILD AND DESIGN BUILDING THROUGH VIRTUAL REALITY 162

VEHICLE ACCIDENT ALERT SYSTEM USING GPS AND GSM 174

MARINE ODYSSEY: A NON-IMMERSIVE VIRTUAL REALITY GAME FOR MARINE LITTER AWARENESS 187

GAME BASED LEARNING FOR FIRE SAFETY AWARENESS AMONG PRIMARY SCHOOL CHILDREN 207

SIMULATING FLOOD DISASTER USING AUGMENTED REALITY APPLICATION 220

CRITICAL THINKER: VISUAL NOVEL GAME FOR BUILDING CRITICALTHINKING SKILLS 231

POPULAR MONSTER: 239

FIGURE SPRINTER: EDUCATIONAL ENDLESS RUNNING GAME TO LEARN 2D AND 3D SHAPE 252

AR MYDREAMHOUSE: AUGMENTED REALITY FOR CUSTOMISING HOUSE 265

RENTAL BIKE SERVICES WITH REAL TIME CHAT ASSISTANCE 308

IDOBI: IOT INTEGRATED SELF-SERVICE WASHING MACHINE RESERVATION SYSTEM WITH CODE BASED BOOKING TOKEN 321

TRADITIONAL POETRY OF UPPER SECONDARY STUDENTS VIA MOBILE APPLICATION 332

A MOBILE TECH HELPER RECOMMENDATIONS APPLICATION USING GEOLOCATION WITH AUTOMATED WHATSAPP MESSENGER..... 347

TURN-BASED ROLE-PLAYING GAME BASED ON MUSIC THEORY 370

FADTRACK: DEVELOPMENT OF VEHICLE TRACKING SYSTEM USING GPS 384

MENTALCARE: GAME-BASED LEARNING ON MENTAL HEALTH AWARENESS 397

HALAL INTEGRITY INSPECTOR:..... 411

MOBILE APPLICATION FOR REAL TIME BABY SIGN LANGUAGE RECOGNITION USING YOLOV8..... 434

TRAVEL TIME CONTEXT-BASED RECOMMENDATION SYSTEM USING CONTENT-BASED FILTERING 448

DETECTION SYSTEM OF DISEASE FROM TOMATO LEAF USING CONVOLUTIONAL NEURAL NETWORK 460

VIRTUAL REALITY (VR) FOR TEACHING AND LEARNING HUMAN ANATOMY IN SECONDARY SCHOOL..... 471

LEARNING KEDAH'S DIALECT VIA GAME-BASED LEARNING 490

AUTOMATED FACIAL PARALYSIS DETECTION USING DEEP LEARNING 504

ENHANCING CRIMINAL IDENTIFICATION: SVM-BASED FACE RECOGNITION WITH VGG ARCHITECTURE..... 517

WEB BASED PERSONALIZED UNIVERSITY TIMETABLE FOR UITM STUDENTS USING GENETIC ALGORITHM..... 528

SMART IQRA' 2 MOBILE LEARNING APPLICATION 545

ANIMAL EXPLORER: A WALK IN THE JUNGLE..... 557

FOOD RECOMMENDATION SYSTEM FOR TYPE 2 DIABETES MELLITUS USING CONTENT-BASED FILTERING 569

WEB-BASED PERSONAL STUDY HELPER BASED ON LESSON PLAN USING GAMIFICATION 580

DIETARY SUPPLEMENT OF COLLABORATIVE RECOMMENDATION SYSTEM FOR ATHLETE AND FITNESS ENTHUSIAST..... 596

AUTOMATED HELMET AND PLATES NUMBER DETECTION USING DEEP LEARNING 611

VIRTUAL REALITY IN MATHEMATICAL LEARNING FOR SECONDARY SCHOOL..... 622

VIRTUAL REALITY (VR) IN CHEMISTRY LEARNING FOR SECONDARY SCHOOLS STUDENTS 634

GOLD PRICE PREDICTION USING LONG SHORT-TERM MEMORY APPROACH 651

ARTQUEST: A VIRTUAL REALITY ESCAPE ROOM FOR LEARNING ART HISTORY LESSONS..... 664

FIRE SURVIVAL: A FIRE SAFETY GAME USING GAME- BASED LEARNING..... 675

ANIMALAR: AN INTERACTIVE TOOL IN LEARNING EDUCATIONAL ANIMAL KINGDOM THROUGH AUGMENTED REALITY 690

PCMJ

Progress in Computer and Mathematics Journal (PCMJ)
volume 1 [October, 2024]
e-ISSN: 3030-6728
Website: fskmjebat.uitm.edu.my/pcmj

CRITICAL THINKER: VISUAL NOVEL GAME FOR BUILDING CRITICALTHINKING SKILLS

Mohamad Amirul Helmi Bin Mohd Jaafar
College of Computing, Informatics and Mathematics
amirulhemi01@gmail.com

Muhammad Hamiz Mohd Radzi
College of Computing, Informatics and Mathematics
hamiz9620@uitm.edu.my

Nurshahidatul Hasana Binti Ishak
College of Computing, Informatics and Mathematics
hasana@uitm.edu.my

Article Info

Received: February 2024
Accepted: August 2024
Available Online: October 2024

Abstract

Malaysia, amidst the challenges of the modern era, faces a growing demand for individuals equipped with robust critical thinking skills in both industry and education. With the lack of tools/game/platform, the idea of promoting critical thinking is in decline. To address this imperative, the project titled "Critical Thinker: Visual Novel Game for Building Critical Thinking Skills" introduces a game named "Critical Thinker." The game's core objective is to assess and improve users' critical thinking skills through an engaging story- based approach. The usability of this game will also be taken into consideration as it will prove this project's success. This gamification application, developed through the Game Development Life Cycle (GDLC) and employing the Visual Novel Framework, aims to enhance critical thinking abilities among university students. Leveraging the System Usability Scale for testing, Critical Thinker aspires to be a valuable tool in fostering the intellectual capacities necessary for navigating the complexities of contemporary Malaysian society. The results show a percentage of 73.86%. Hence, the third objective of the Critical Thinker game has been satisfied. The future works of this project would be expanding of the game's narrative approach, implementing of the inventory system, and enhancing the design of characters and environments.

Keywords: Two-Dimensional, Critical Thinking Skills, Visual Novel, Gamification, Game Development Life Cycle, System Usability Scale

INTRODUCTION

Malaysia, recognized for its diversity and economic progress, has made strides in education but faces challenges in developing critical-thinking skills among students (Wooll, 2022; Herrity, 2023; Ren, 2020). Despite governmental initiatives, challenges in socioeconomic development, political stability, and environmental sustainability highlight the pressing need for individuals with strong critical-thinking abilities (Mahmood & Othman, 2020).

The Integrated Curriculum for Secondary Schools and the Malaysia Education Blueprint 2013-2025 emphasize critical thinking, yet studies show that after eleven years of learning, Malaysian students struggle to apply critical thinking (Afifah and Nurbarirah, 2017). To address this, organizations like the American Management Association and Penang Institute offer courses and propose policy measures to enhance critical thinking in collaboration with the government (Hwa Yue-Yi, 2016). These efforts aim to improve teacher training, instructional resources, and overall education quality to foster critical-thinking skills among Malaysian students.

LITERATURE REVIEW

Games have transcended their initial role as entertainment tools, gaining recognition for their educational potential (LinkedIn, 2023). Gamification, the application of game design principles in non-game contexts, particularly excels in promoting critical thinking skills. By integrating elements like objectives, rules, feedback, and challenges, gamification transforms various activities into engaging experiences. In education, this approach proves effective in making learning enjoyable, tracking progress, and nurturing students' curiosity (Cujba, 2023). Thus, the choice of creating a visual novel game for building critical thinking skills called Critical Thinker has been made.

Gamification goes beyond mere enjoyment; it acts as a catalyst for positive behavior change and improved knowledge retention. Dynamic gaming environments allow users to

experience a sense of progression, enhancing their self-efficacy and intrinsic motivation. In comparison to traditional teaching methods, gamification, with its diverse elements such as rewards, storylines, time pressure, personalization, and micro-interactions, creates a multifaceted and motivating learning experience (Kozioł, 2023).

Exploring Diverse Game Genres: Visual Novels

Among the diverse game genres, the visual novel stands out as a captivating choice for its emphasis on interactive storytelling (Geest, 2015). Visual novels provide a unique platform for critical thinking development through features like branching narratives, ethical dilemmas, puzzles, and emotional exploration. The genre offers a rich tapestry of elements that engage players in decision-making processes and promote a reflective understanding of complex scenarios (Klotz, 2021).

In the context of this project, the visual novel genre is chosen as it aligns with the goal of creating an interactive and educational desktop-based 2D application. The focus on storytelling, character development, and decision-making within visual novels provides an ideal foundation for integrating critical thinking elements into the user experience.

Ren'Py: Empowering Visual Novel Development

Ren'Py emerges as a powerful and user-friendly visual novel engine designed to empower developers in crafting interactive storytelling experiences (Ciesla, 2019). Developed by Tom "PyTom" Rothamel, Ren'Py employs its scripting language, based on Python, to simplify the creation of visual novel games. The engine supports key elements such as visual assets, text-based dialogue, choices and branching paths, transitions and effects, audio capabilities, and cross-platform compatibility.

The scripting language allows non-programmer developers to structure the flow of visual novels seamlessly. Visual elements like user interface components, backdrops, and character sprites enhance the storytelling experience. Ren'Py's support for dialogue, choices, and branching paths facilitates the creation of dynamic narratives. Transitions, audio integration, and cross-platform compatibility further contribute to a comprehensive toolkit for developers. Utilizing Ren'Py's features effectively enables the creation of visually appealing, immersive, and interactive educational applications.

PCMJ

Progress in Computer and Mathematics Journal (PCMJ)
volume 1 [October, 2024]
e-ISSN: 3030-6728
Website: fskmjebat.uitm.edu.my/pcmj

METHODOLOGY

The Game Development Life Cycle (GDLC) is a systematic approach to creating video games, encompassing all stages of game development from conception to release. It provides a framework for organizing and managing the various tasks and processes involved in developing a game, ensuring that it meets the desired quality standards and is delivered on time and within budget (Theofilus, 2021). This project utilizes the Game Development Life Cycle (GDLC) as its development methodology since it is an iterative approach and allows for more adjustments to be made as they arise. Additionally, this process includes two testing rounds, increasing the likelihood that the final product's quality will be maintained.

According to Mustofa (2021), the development process consists of three core activities, namely design and prototyping, production, and testing, as may be inferred from the many versions of GDLC utilize by various development teams. As a result, there are 6 stages of development in the suggested GDLC: initiation, pre-production, production, testing, beta, and release. For this project, the implementation of GDLC only includes four phases which are initiation, pre-production. production and testing (Alpha version). Beta and release are not included due to the limited time management for the project development.

In the initiation phase, the foundational concept and gameplay mechanics for a visual novel game set in a university campus were developed, emphasizing critical thinking in problem-solving. The pre-production stage involved creating a flowchart and storyboard to guide the project's direction, ensuring alignment with its goals. In the gameplay section, players explore the story, making choices that impact the narrative and lead to different endings based on points earned through critical thinking characteristics. The production phase involved utilizing graphic editors like Adobe Photoshop, Ibis PaintX, and Canva, along with the Ren'Py Visual Novel Engine. Windows 10 was chosen as the operating system, and testing involved assessing the prototype's functionality and user experience, using the System Usability Scale to gather insights for refinement and improvement.

PCMJ

Progress in Computer and Mathematics Journal (PCMJ)
volume 1 [October, 2024]
e-ISSN: 3030-6728
Website: fskmjebat.uitm.edu.my/pcmj

RESULT AND DISCUSSION

In this section, the project conducted an evaluation focusing on the usability of the Critical Thinker game, utilizing the System Usability Scale (SUS). Users actively engaged with the application, offering feedback, and identifying usability issues, which were then analyzed to enhance the application's design and functionality. This approach was vital to ensure the game effectively met user needs and aligned with project objectives.

Evaluation findings provided valuable insights into the application's performance and user impact, demonstrating a positive resonance with users, and contributing to their understanding. Additionally, demographic analysis offered context on participants' educational levels, enriching research results and aiding practical application. The SUS questionnaire, comprising ten questions assessing user-friendliness, provided a comprehensive evaluation, with Table 1 illustrating SUS adjective ratings derived from user feedback scores, offering further insights into the application's usability.

Table 1: SUS Score Result

Items / Resp	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	Total
1	5	5	5	5	5	5	5	5	5	5	50
2	5	5	5	1	5	2	5	1	5	2	85
3	4	2	5	3	4	3	4	2	4	3	70
4	4	1	5	1	5	1	4	1	5	1	95
5	4	3	5	1	5	2	4	2	4	2	80
6	5	3	5	3	5	3	5	3	5	3	75
7	5	1	5	1	5	1	5	1	5	1	100
8	4	2	5	1	5	5	5	2	4	4	72,5
9	5	5	5	5	5	5	5	5	5	5	50
10	4	4	3	1	3	2	4	2	5	1	72.5
11	4	4	4	4	4	2	4	2	4	3	62.5
										Average	73.86363636

PCMJ
Progress in Computer and Mathematics Journal (PCMJ)
volume 1 [October, 2024]
e-ISSN: 3030-6728
Website: fskmjebat.uitm.edu.my/pcmj

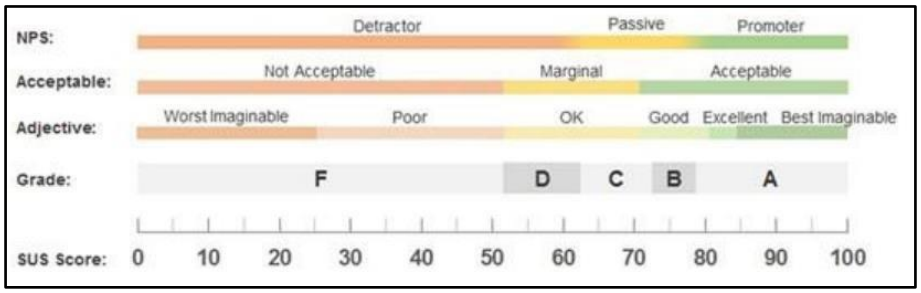

Figure 1 System Usability Scale Grading (Perdana, 2023)

In System Usability Scale (SUS), each answer has a value from 1 to 5. In Guerci's (2020) estimation, the odd items (1, 3, 5, 7 and 9) on the SUS questionnaire require a deduction of 1 from the total score. Meanwhile, the even items (2, 4, 6, 8, and 10) deduct the score from 5. It is necessary to total the points for each item for each respondent, multiply that total by 2.5. The average is determined upon obtaining the entire score for every respondent. Afterward, the average will be graded accordingly.

$$SUS\ Average\ score = ((n1 - 1) + (5 - n2) + (n3 - 1) + (5 - n4) + (n5 - 1) + (5 - n6) + (n7 - 1) + (5 - n8) + (n9 - 1) + (5 - n10)) \times 2.5$$

After being rounded, the total average score is 73.86%, as shown in table 5.1. Since the average score falls between 68 and 74, it will receive a C, meaning that user interaction is simple, and the system is valuable. Overall, players can utilize and enjoy the game with good usability. The average score's value serves as evidence for this.

REFERENCES

Afifah Fadhlullah & Nurbarirah Ahmad. (2017, August 30). Thinking Outside of The Box: Determining Students'' Level of Critical Thinkingt Skills. Retrieved from uitm.edu.my: https://ir.uitm.edu.my/id/eprint/21917/1/AJ_AFIFAH%20FADHLULLAH%20AJUE%2017.pdf

Ciesla, R. (2019). In R. Ciesla, Game Development with Ren'Py: Introduction to Visual Novel Games Using Ren'Py, TyranoBuilder and Twine.

Cujba, S. (2023, March 17). Gamification in Education and its Examples. Retrieved from Racoon Gang: https://raccoongang.com/blog/gamification-education-and-its-examples/

Geest, D. v. (2015, January 13). The role of Visual Novels as a Narrative Medium. Retrieved from Universiteit Leiden: https://studenttheses.universiteitleiden.nl/access/item%3A2607373/view

Guerci, J. (2020, 5). Easily calculate SUS Score. From uxplanet: https://uxplanet.org/easilycalculate-sus-score-a464d753e5aa

Herrity, J. (2023, February 25). 5 Top Critical Thinking Skills (And How To Improve Them). Retrieved from Indeed: https://www.indeed.com/career-advice/career-development/critical-thinking-skills

Klotz, H. (2021, June 2). The Value of the Visual Novel as Literature. Retrieved from The Michigan Daily: https://www.michigandaily.com/arts/the-value-of-the-visual-novel-as-literature/

Kozioł, A. (2023, April 10). What Is Gamification? Retrieved from ARIBO: https://aribo.app/what-is-gamification/

Mohd Sobri Mahmood & Mohamad Khairi Othman. (2020, July 7). Learning Style Practices and Critical Thinking of Students in Malaysia. Retrieved from hrpub.org: https://www.hrpub.org/download/20200730/UJER33-19516335.pdf

Mustofa Mustofa, Jordy Lasmana Putra & Chandra Kesuma. (2021, January 25). Penerapan Game Development Life Cycle Untuk Video Game Dengan Model Role Playing Game. Retrieved from Co-Science: http://jurnal.bsi.ac.id/index.php/co-science/article/view/158

Perdana, K. A. (2023). Analisis Usability Pada Game Visual Novel Dengan Metode Usailty Testing (Studi Kasus : Game Manggapai Matahari). Kurniawan Adi Perdana.

Ren, X. (2020, September 1). Critical Thinking Predicts Academic Performance Beyond General Cognitive Ability: Evidence From Adults And Children. Retrieved from

ScienceDirect: https://www.sciencedirect.com/science/article/abs/pii/S0160289620300659

Sánchez, M. (2023, March 8). The Power Of Open-Mindedness And Curiosity In Stimulating Creativity (ENG). Retrieved from LinkedIn: https://www.linkedin.com/pulse/power-open-mindedness-curiosity-stimulating-eng-mauricio-sánchez

Theofilus, G. (2021, December 28). Development of Game-Based Learning Traffic Order For Android With The Game Development Live Cycle Method. Retrieved from IEEE: https://ieeexplore-ieee-org.ezaccess.library.uitm.edu.my/document/9649553

Wooll, M. (2022, March 14). Critical thinking is the one skillset you can't afford not to master. Retrieved from BetterUp: https://www.betterup.com/blog/critical-thinking-skills#:~:text=Critical%20thinking%20is%20the%20ability,and%20decision-making%20more%20effectively

Yue-Yi, H. (2016, August). From drills to skills? Cultivating Critical Thinking, Ceativity, Communication, And Collaboration Through Malaysian Schools. Retrieved from Penang Institute: https://penanginstitute.org/wp-content/uploads/jml/files/research_papers/HwaYY_Four_Cs_working_paper_28October2016.pdf

PCMJ

Progress in Computing and Mathematics Journal

UNIVERSITI TEKNOLOGI MARA
Cawangan Melaka

eISSN 3030-6728