Universiti Teknologi MARA
Cawangan Melaka

PCMJ

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volume 1

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

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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
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AUGMENTED REALITY FLASH CARDS : LEARNING SYLLABLE WITH MALAY VOWEL

Azira Syafiqa Binti Md Shih
College of Computing ,Informatics and Mathematics
University Technology MARA

Hazrati Binti Zaini
College of Computing ,Informatics and Mathematics
University Technology MARA
hazrati_zaini@uitm.edu.my

Dr Noor Suriana Binti Abu Bakar
College of Computing ,Informatics and Mathematics
University Technology MARA
suriana_su@uitm.edu.my

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Abstract

This project aims to develop interactive flashcards designed to teach children Malay vowels and syllables using augmented reality technology. The challenges lie in incorporating phonics to effectively teach syllables and the limitations of traditional learning methods in engaging children in the learning process. The flashcards utilize augmented reality markers that, when viewed through a mobile device, trigger 3D animations and pronunciation sounds, thereby making the learning process both engaging and enjoyable. These flashcards, designed in a jigsaw-style format, incorporate interactive pictures, animations, and sounds to effectively captivate children and facilitate their understanding of syllables. Augmented reality technology and interactive teaching methods offer promising avenues to enhance language acquisition and improve learning outcomes among children aged 5 to 8 years old.

Keywords: Augmented Reality(AR), Children, Flashcards, Animation, Malay vowel.

INTRODUCTION

Learning syllables involves developing an understanding of the individual sound units that make up words. Syllables play a significant role in phonological awareness, or the capacity to identify and alter the acoustic properties of words. The study by Galatang and Suyanto (2020) emphasizes the benefits of a syllable-based Malay language model in speech recognition systems. It highlights the advantages of comparable performance and ease of use. Syllables are crucial linguistic units when labeling and modeling prosody, as they are considered the most important in these analyses. Learning vowels is critical for language and literacy development. However, teaching young children vowel pronunciation can be challenging. Flashcards with augmented reality markers, as discussed by Kim and Kim (2020), offer an engaging method. These flashcards animate and display 3D representations when viewed through a mobile device, assisting children in learning syllables. The project aims to enhance reading and writing skills in Malaysian children through augmented reality (AR) flashcards, adapting phonics to Malay. Neha and Mantri (2020) highlight the interactive nature of virtual data, which aligns with the project's use of augmented reality technology for teaching Malay vowels. The flashcards, designed in a jigsaw-style format, engage children in an interactive and enjoyable learning process. Using a combination of interactive graphics, animations, and sounds, learners can better understand syllables. Kim and Kim (2020) demonstrate the efficiency of this method for teaching syllables to young language learners. Therefore, incorporating augmented reality markers into flashcards can be a helpful and fun activity for teaching syllables.

LITERATURE REVIEW

Syllables are fundamental units of speech, constituting one or more sounds spoken together to form words. Phonetics, explored by Birsh & Carreker (2018), involves mapping phonemes to their spellings and vice versa, crucial for reading and spelling skills (Moats & Tolman, 2019). Phonics instruction, starting in kindergarten, teaches letter names and corresponding sounds. Vowels, produced with unobstructed airflow, are pivotal in language, including Malay, where pronunciation nuances alter word meanings (Asmah, 2008; Shaharina & Shahidi, 2012).

Developing phonological awareness enhances reading skills. Alves and Lousada (2016) define it as understanding spoken word parts and manipulating sounds. Breaking words into syllables aids comprehension and phonological awareness, crucial for decoding new words and fluency.

Interactive learning, advocated by Kashlev and supported by Kiyasova et al. (2022), fosters engagement and knowledge acquisition. AR flashcards, as a tool, offer dynamic learning experiences. They feature markers triggering 3D animations and vocalizations, aiding vowel pronunciation. Through vibrant visuals and auditory cues, children grasp and retain vowel sounds effectively.

Method of Learning with Augmented Reality

Augmented Reality (AR) is a technology that adds digital information and virtual things to the actual environment. It entails superimposing digital content on top of the user's view of the real world, which is often accomplished with a camera and a display device such as a smartphone or headset. According to Antosch and Lin's "Learn French Online" on French flashcards (2008), flashcards have been extensively utilized in diverse online learning environments. Digital content is usually in sync with reality and can be used interactively in real-time. AR has a wide range of uses, including education, entertainment, marketing, and training.

Marker-based and marker-less

Marker-based augmented reality (AR) flashcards utilize 3D animal models starting with Malay vowel sounds (a, e, i, o, u). Users scan the flashcards using an AR app on iOS and Android devices, accessing interactive 3D representations of animals. The flashcards feature animals corresponding to Malay vowels, offering visual and audio information for a multisensory learning experience. This integration fosters curiosity, enhances pronunciation skills, and promotes cultural awareness. Visual and auditory cues aid letter and sound recognition, especially for young learners. Early research by Yi and Park (2019) supports augmented reality's value in promoting early literacy skills. Marker-less AR, also known as location-based AR, utilizes GPS to display location-related information, combining computer graphics with real-world imagery.

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Related Works of Augmented Reality for Teaching Syllables Using Flashcards

Vuforia is an AR platform based on Unity 3D, enabling developers to create AR applications for mobile devices and glasses (Xinqi Liu et al., 2018). It supports cross-platform AR for iOS, Android, and Windows, offering local and cloud-based storage for thousands of objects (A. Hanafi et al., 2019). Vuforia detects and tracks targets by analyzing target features observed by the camera.

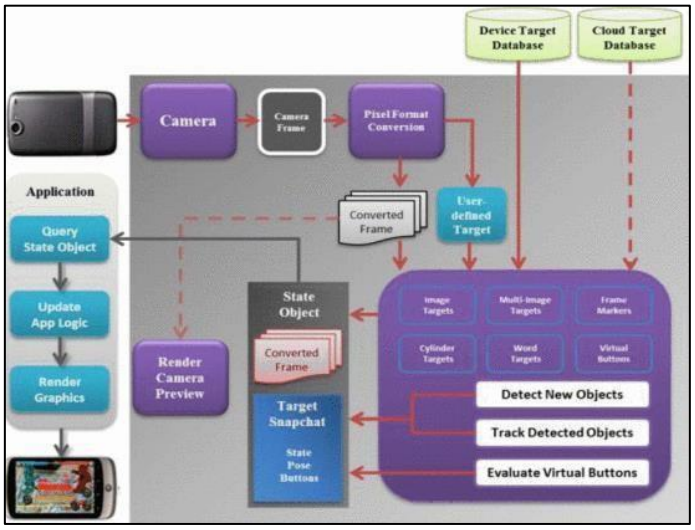

Figure 1: Vuforia augmented reality SDK
(*Source*: Chih-HsiaoTsai1, Jung-Chuan Yen,2014)

Guideline Flashcards engage students with illustrated narratives recognized by children as they learn new words (J. Dean, 2008). Font selection for interactive flashcards is crucial. Fonts like Arial Rounded MT Bold, Century Gothic, Sassoon Primary, and KG Key Writing suit child-friendly designs. Bright, vibrant colors, like red, yellow, orange, and green, create an energetic atmosphere, improving mood and well-being (Maria Adcock, 2018). Considerations for font and color choices account for children's developmental stages and preferences.

Review Of Methodologies

The waterfall model, originating in the 1970s, offers a structured approach to software development. It progresses through phases like requirements gathering, design, implementation, testing, and maintenance. Dima & Maassen (2018) note its strength in providing upfront specifications but highlight its limited flexibility to accommodate changes during development, making it best suited for stable requirements.

Agile methodology emphasizes flexibility and adaptability. It begins with strategy meetings, translating business needs into a product roadmap. Sprints, short development cycles, focus on completing backlog items within one to four weeks, fostering continuous improvement and adjustment based on feedback.

The Spiral Model, a risk management-oriented SDLC model, operates in iterative loops tailored to project difficulty. Dhruv Doshi (2021) mentions its adaptability to manage risks, with stages comprising risk identification, requirement analysis, development, and evaluation. It allows integration of other process models to mitigate risks and clarify user requirements as needed.

Agile methodology suits software projects with evolving requirements, including AR flashcard application development. It enables iterative, incremental progress through user stories, prioritized features, and short sprints, fostering efficiency and continuous improvement via user feedback. Waterfall offers structured planning but lacks flexibility, while Spiral combines iterative development with risk management. Methodology choice hinges on project requirements, client needs, and desired flexibility during development.

METHODOLOGY (HEADING 1)

The project adopts Agile methodology, well-suited for AR development due to its flexibility and adaptability to changing needs and user feedback. Agile's iterative approach enhances projects in small batches, reducing risk and accelerating adaptation (Tay, 2008). It emphasizes early planning for development process interactions. Software Development Life Cycle (SDLC) models like spiral, waterfall, and RAD offer distinct advantages (Tobin J Lehman, 2011). SDLC encompasses planning, analysis, design, programming, testing, and maintenance stages, with model choice dependent on specific project needs. However, this project focuses on exploring Agile processes and methodologies, emphasizing customer satisfaction and direct user involvement (A. Ahmed et al., 2010). Agile project management prioritizes a clear project purpose through strategy sessions (J.R. Johnivan, 2022). Agile's core value emphasizes

individuals and interactions over processes and tools. A cohesive team and effective tool utilization are paramount for project success.

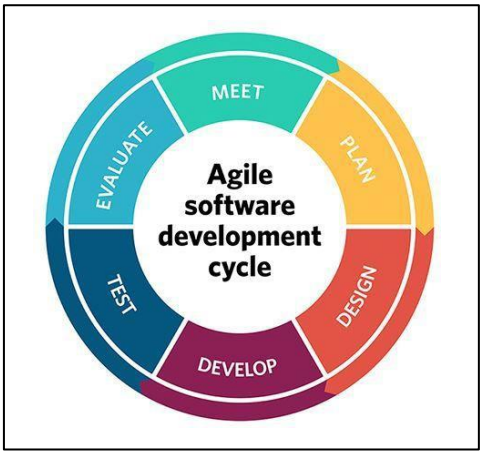

Figure 2: Agile Methodology
(*Source:* Daniel Raymond,2023)

RESULT AND DISCUSSION (HEADING 1)

The augmented reality project's usability as a teaching aid was evaluated by gathering input from parents and teachers, employing a System Usability Scale (SUS) questionnaire. The questionnaire assessed usability and learnability aspects of the app, focusing on ease of use and proficiency in learning.

Testing findings revealed an equal participation of male and female participants (50%), including parents and educators working with children aged 5–8. The project evaluation aimed to determine its usefulness as a teaching tool for vowels and syllables, utilizing augmented reality as an innovative teaching technique.

Data from each participant were averaged and multiplied by 2.5 using the SUS scale algorithm to assess overall project helpfulness. A higher percentage indicated a better score, with details of the calculation provided below.

Average SUS = (Total SUS Score) / (Total Number of Respondents)

= 2062.5 / 25

= 82.5

Percentage = (Average SUS / Maximum possible SUS score) * 100

= (82.5 / 100) * 100

= 82.5%

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