

DESIGN, DEVELOPMENT AND EVALUATION OF AN INTERACTIVE 2D ANIMATION-BASED LEARNING SYSTEM FOR BAHASA MELAYU GRAMMAR ACQUISITION

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ABSTRACT

Animation has emerged as a significant asset for facilitating language acquisition in the contemporary, rapidly digitalizing educational landscape, as it enhances learner engagement and promotes comprehension and retention. Conventional language teaching methods sometimes depend on fixed, text-based materials, making abstract grammatical concepts difficult for students to understand. Interactive 2D animation offers a more accessible and engaging alternative by visually and meaningfully conveying the language curriculum, allowing learners to connect theory with practical application. This research examines the development of an interactive 2D animation instructional tool designed to aid secondary school students in learning Bahasa Melayu, with a particular focus on Golongan Kata. The animation's effectiveness was assessed by systematic testing with subject matter experts, students, and multimedia professionals, focusing on learner engagement and language proficiency. The results demonstrate that interactive animation significantly enhanced students' interest, engagement, and academic performance. The study underscores the potential of multimedia-based methodologies to enhance the engagement and efficacy of Bahasa Melayu learning, advocating for a transition towards more interactive and learner-centered methods in language education.

Keywords: *Interactive Animation, Language Learning, Bahasa Melayu Education, Digital Learning Tools, Linguistic Proficiency*

1. INTRODUCTION

The acquisition of essential grammatical categories, including verbs, nouns, particles, and adjectives in Bahasa Melayu, remains a challenge for many students. Nevertheless, the early introduction and subsequent examination of these subjects from Form 1 to Form 5 in secondary school, students often find it challenging to understand and retain them effectively. Occasionally, grammar instruction is presented through verbose explanations and monotonous exercises, which may not accurately depict the practical usage of language in daily situations or engage students. This can be discouraging for many learners, as they struggle to use grammatical principles accurately and confidently. This highlights the necessity of teaching methods that are more interactive and student-centered, thereby assisting learners in the

development of both understanding and confidence in Bahasa Melayu grammar.

This study suggests the creation of an interactive animation educational tool aimed at enhancing the engagement and accessibility of learning Bahasa Melayu grammar. This method aims to integrate educational material with 2D animation to create a learning experience that is both effective and enjoyable. The integration of visual and interactive elements seeks to accommodate diverse learning styles, enhance understanding, and bolster students' retention of fundamental grammatical principles. This strategy seeks to improve students' overall learning experience while fostering greater motivation and confidence in understanding Bahasa Melayu grammar.

The primary objective was to develop a digital learning aid that was both entertaining and a viable alternative to traditional textbook-based training. This tool would make linguistic principles

more dynamic, visually appealing, and accessible. The animation was designed to reinforce fundamental language concepts and encourage active learning by incorporating essential interactive elements, including a comprehensive video storage system and an organized note interface.

The significance of this initiative is underscored by the fact that current educational resources often fail to address the unique challenges faced by Malaysian students in achieving proficiency in Bahasa Melayu. The animation was created in accordance with the Malaysian curriculum to ensure that it is pedagogically relevant and can be adapted to the educational requirements of students. Therefore, this study aims to develop and evaluate an interactive 2D animation designed to improve students' understanding, engagement, and learning efficiency in the topic Golongan Kata.

2. LITERATURE REVIEW

2.1 Current Works

In many classrooms, the teaching of Bahasa Melayu grammar, particularly Golongan Kata, still depends on static learning resources such as digital text-based materials, recorded videos, and printed textbooks [1-12]. Although these resources explain grammatical concepts clearly, they often do not encourage students to actively engage with the material. Text-based digital resources usually require students to read and remember information on their own, while instructional videos tend to place learners in a passive role. Without opportunities to interact, practice, or receive feedback, students may find it difficult to stay engaged and fully understand grammar concepts over time.

Print textbooks remain a common element of classroom instruction; however, their static design and conventional layout may appear antiquated. As they exclusively rely on text and images, they frequently struggle to captivate students' attention or accommodate the diverse learning styles present in a classroom. Consequently, numerous students grapple with the challenges of comprehending, retaining, and implementing intricate grammar concepts. These limitations underscore the necessity of more interactive and innovative learning tools-approaches that not only enhance the engagement of grammar but also assist students in developing confidence and establishing a genuine connection with the material.

Recent studies [13-40] have highlighted the ability of animated content to improve language acquisition and aid students' understanding of complex subjects. Nevertheless, many contemporary

technologies are significantly limited; they are often designed for broad user rather than tailored specifically for students or educators. Furthermore, most programs lack interactivity, and their knowledge may be outdated, failing to align with current curricula. While previous studies have acknowledged the promise of 2D animations in language instruction, they rarely examine their effects on students' cognition or the experiences of different stakeholders; educators and learners. This study seeks to address these deficiencies by designing and assessing a 2D animation application tailored for instructing Golongan Kata in Bahasa Melayu, with the objective of fostering a more engaging, interactive, and substantive learning experience for students.

2.2 Interactive 2D Animation Bahasa Melayu (Golongan Kata)

In light of the deficiencies in current instructional materials, the suggested interactive 2D animation aims to provide an innovative method for learning Golongan Kata. The initiative seeks to enhance student engagement and facilitate a deeper comprehension of grammatical principles through the integration of dynamic images and interactive features. In contrast to conventional, static techniques, animation promotes active learner engagement with the content, facilitating a more meaningful exploration and application of concepts. This interactive approach immediately addresses the shortcomings identified in previous resources and provides a more customized educational experience that can accommodate diverse learning styles and paces.

The animation is divided into two primary modules: (i) a summarization module and (ii) an exhaustive learning module. The animation integrates painstakingly designed visual elements, engaging 2D animations, and a background music to enhance the overall educational experience. The curriculum, structured as a video-based 2D animation model, aims to improve secondary school students' understanding of Golongan Kata in Bahasa Melayu. Figures 1 to 5 illustrate selected screenshots from the Interactive 2D Animation Bahasa Melayu (Golongan Kata), highlighting the visual design, animation development, and instructional substance of the developed system.



Figure 1: Screenshot of the main page



Figure 2: Screenshot of the modules page

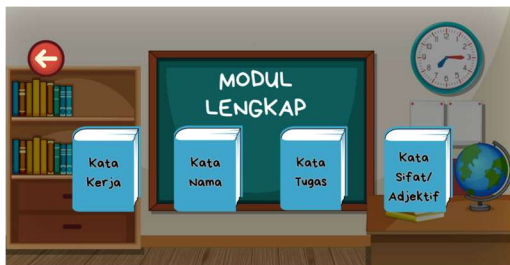


Figure 3: Screenshot of the first module page



Figure 4: Screenshot of the first sub-module animation



Figure 5: Screenshot of the second module page

3. METHODOLOGY

The proposed animation is created utilizing the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) instructional design methodology, which offers a clear and systematic framework for the creation of educational materials. By progressing through each phase of the approach, the development process remains centered on students' needs and educational objectives. This ensures that the animation aids students in comprehending and retaining Golongan Kata while also rendering the process of studying Bahasa Melayu more engaging and pleasant. The integration of interactive elements with a systematic instructional framework signifies a pragmatic advancement in enhancing grammar training beyond conventional teaching methods.

This study explores how effective and acceptable an interactive 2D animation is in helping Form 1 to Form 5 students understand Bahasa Melayu topic Golongan Kata. To gain a well-rounded view, the evaluation involves different groups of respondents, including subject matter experts, multimedia experts, and students, each sharing insights from their own perspectives. Bringing together feedback from these groups allows the study to better understand not only how well the animation supports learning, but also how usable and engaging it is for its intended users.

A questionnaire was the principal tool utilized for gathering feedback to assess the animation's effectiveness. Subject area experts were solicited to provide their insights on the educational value of the animation and its efficacy in facilitating students' understanding of grammar and syntax. Multimedia specialists contributed insights regarding the design, technical quality, and general functionality of the animation. Students completed surveys to assess their comprehension of Golongan Kata and their engagement with the animation compared to traditional teaching methods. The study combined feedback from professionals and students to attain a comprehensive understanding of the animation's effectiveness, usability, and overall educational experience.

The testing environment was tailored to meet the distinct requirements of each participant group. Subject area experts participated in both in-person and online evaluations, accessing the animation through a YouTube link and submitting feedback via paper or digital questionnaires. Multimedia specialists and the general public primarily interacted online with Google Forms,

Table 1: Testing Respondents

	Multimedia Expert	Subject Matter Expert	Students
General Information	These are people with expertise in multimedia and information technology.	These are individuals who specialize in language education, especially in teaching and mastering Bahasa Melayu grammar.	These are Form 1 to Form 5 students or anyone interested in learning about "Golongan Kata."
Description	To evaluate the technical aspects, visual appeal, and user engagement of the interactive animation.	To identify the quality and relevance of the content, particularly focusing on "Golongan Kata."	To evaluate the ease of use, accessibility, and educational effectiveness of the animation.

enabling adaptable and remote participation. Students engaged with the animation in a classroom environment under instructor supervision, creating a controlled setting that ensured consistency and reliability in the results. This methodology enabled the collection of comprehensive feedback from all groups while ensuring a systematic and supportive evaluation process.

A comprehensive comprehensive and explicit test schedule was established to facilitate the testing process and ensure its seamless execution. The timetable delineated each phase, from formulating the test plan to establishing the testing environment and executing the testing sessions. By adhering to this structured plan, the research team successfully completed each phase punctually and ensured the data gathered was dependable and uniform.

The grading method for data analysis was developed to accurately reflect respondents' perceptions in a clear and significant manner. Subject area and multimedia professionals utilized a 4-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree" to evaluate different aspects of the animation. A simplified binary option was presented to students and the general public, allowing them to assess the effectiveness of 2D animation in comparison to traditional textbooks. This scoring approach enabled a comprehensive study of the responses, assisting in the identification of trends, strengths, and areas for improvement in both the design and implementation of the animation.

3.1 Test Description

During the testing and evaluation phase, questionnaires were administered to the target users in either digital or printed format as part of the user acceptance testing procedure. Before completing the questionnaire, participants were required to view the animation titled Interactive 2D Animation Bahasa

Melayu (Golongan Kata) to ensure a consistent evaluation experience. All questionnaire items were mandatory and had to be completed by each participant. In the final section of the questionnaire, respondents were asked to submit open-ended comments and suggestions for potential improvements and future enhancements to the animation.

3.2 Test Data

The outcomes from the testing activities were meticulously recorded to assess the overall efficacy of the interactive 2D animation. The data acquired from user acceptance testing and functionality testing were analyzed to efficacy of the interactive 2D animation. The data acquired from user acceptance testing and functionality testing were analyzed to ascertain if the animation achieved its intended educational goals. This method allowed the researchers to assess the animation's effectiveness as an educational resource and its correspondence with users' expectations.

The responses gathered during testing were first organized and reviewed before analysis took place. Participants' answers were carefully examined, and descriptive statistics were applied to present the results clearly. Mean scores were calculated for each questionnaire item and then used to determine an overall average score. This process offered useful insights into user perceptions and supported a structured evaluation of the animation's effectiveness.

Table 2: Test Data for User Testing

Respondent Category	Number of Respondents
Multimedia Expert	3
Subject Matter Expert	4
Student	30

Table 3: Details of Multimedia Expert

No.	Respondent	Position
1	Respondent 1	Digital Executive, Madex Group Sdn. Bhd.
2	Respondent 2	Storyboard Artist, 2D Animator, Boneybone Studio Sdn. Bhd.
3	Respondent 3	Graphic Designer, Marco Corporation (M) S/B

Table 4: Details of Student

Institution	Total	Age	Gender
SMK Temin, Jerantut, Pahang, Malaysia	15	13 -17 years old and more than 17 years old	Male (9) Female (6)
SMKA TAHAP, Jerantut, Pahang, Malaysia	8	16 – 17 years old	Male (5) Female (3)
SMK Pulau Tawar, Jerantut, Pahang, Malaysia	7	13 -17 years old	Male (4) Female (3)

Table 5: Details of Subject Matter Expert

No.	Respondent	Position
1	Respondent 1	Bahasa Melayu Instructor, Sekolah Menengah Kebangsaan Temin, Jerantut
2	Respondent 2	Bahasa Melayu Instructor, Sekolah Menengah Kebangsaan Pulau Tawar, Jerantut
3	Respondent 3	Bahasa Melayu Instructor, Sekolah Menengah Tengku Ampuan Hajjah Afzan Pahang, Jerantut
4	Respondent 4	Bahasa Melayu Instructor, Sekolah Menengah Tengku Ampuan Hajjah Afzan Pahang, Jerantut

4. DATA ANALYSIS AND RESULTS

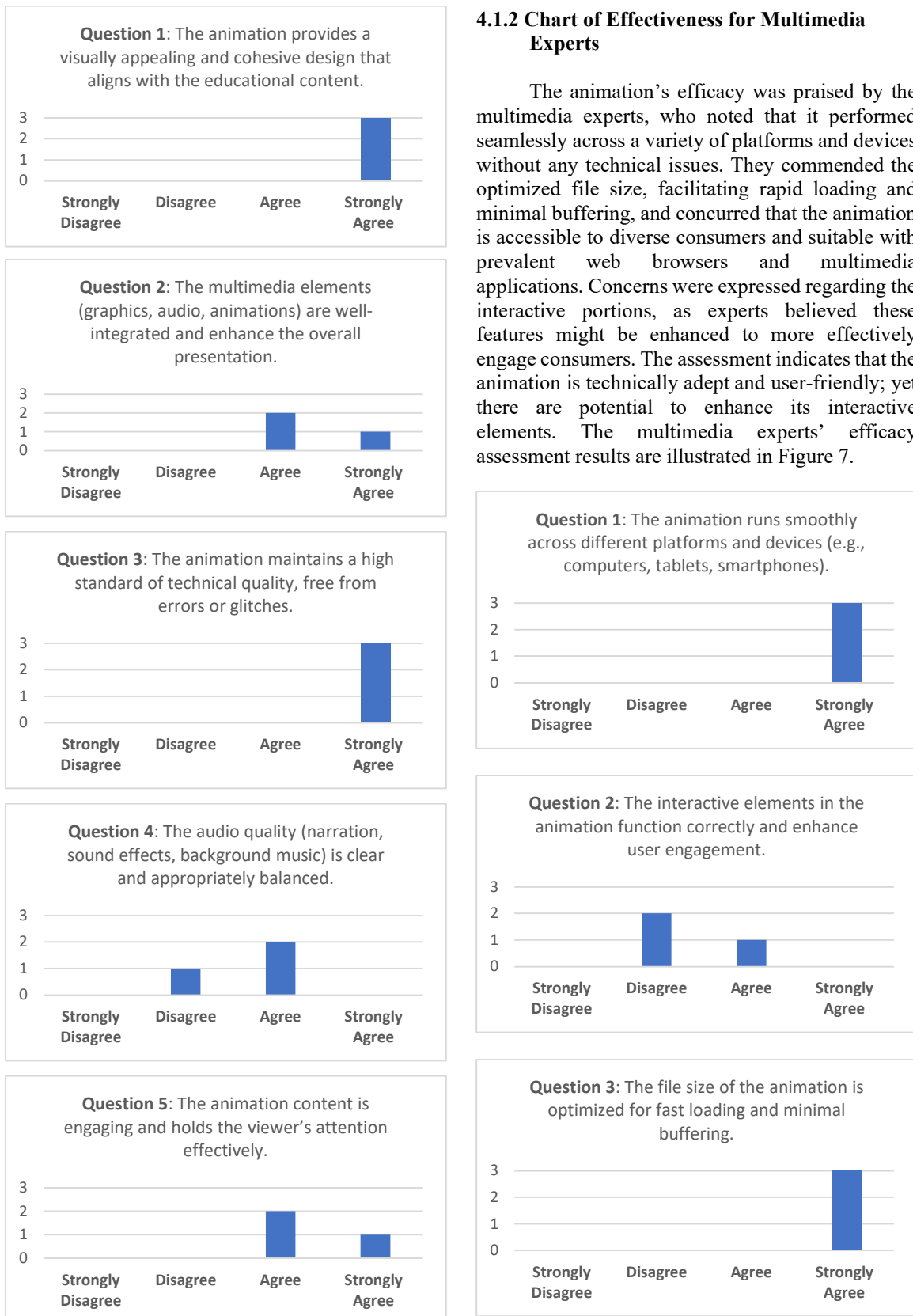
The study's conclusions are illustrated through diagrams and charts to succinctly convey the outcomes of the system testing. These graphic representations elucidate significant patterns and trends detected during the evaluation process, facilitating comprehension and interpretation of the findings.

4.1 Multimedia Experts

Three multimedia specialists participated in the assessment of the interactive 2D animation by filling out predefined questionnaires. Chosen for their expertise in multimedia design and technology, these specialists provided insightful evaluations concerning the animation's quality, usability, and instructional effectiveness. Their responses were analyzed and illustrated graphically, offering a concise overview of the animation's efficacy in facilitating learning. The findings indicate that interactive 2D animation possesses significant potential to improve the learning experience of students studying Golongan Kata in Bahasa Melayu.

4.1.1 Chart of Content for Multimedia Experts

The multimedia specialists unanimously agreed that the animation's educational content is closely aligned with its visually appealing and well-integrated design. They stated that the visual elements were effective and did not contain any features that could potentially distract learners. The experts generally believed that the overall presentation was improved by the use of visuals, transitions, and animations in terms of multimedia integration. Despite the fact that the graphics and transitions were described as engaging, the audio quality was the subject of minor concerns. Despite this constraint, the experts were able to maintain the attention of the audience by identifying the content as well-organized and engaging. Figure 6 shows the results of the content evaluation done by the multimedia specialists.



4.1.2 Chart of Effectiveness for Multimedia Experts

The animation’s efficacy was praised by the multimedia experts, who noted that it performed seamlessly across a variety of platforms and devices without any technical issues. They commended the optimized file size, facilitating rapid loading and minimal buffering, and concurred that the animation is accessible to diverse consumers and suitable with prevalent web browsers and multimedia applications. Concerns were expressed regarding the interactive portions, as experts believed these features might be enhanced to more effectively engage consumers. The assessment indicates that the animation is technically adept and user-friendly; yet there are potential to enhance its interactive elements. The multimedia experts’ efficacy assessment results are illustrated in Figure 7.

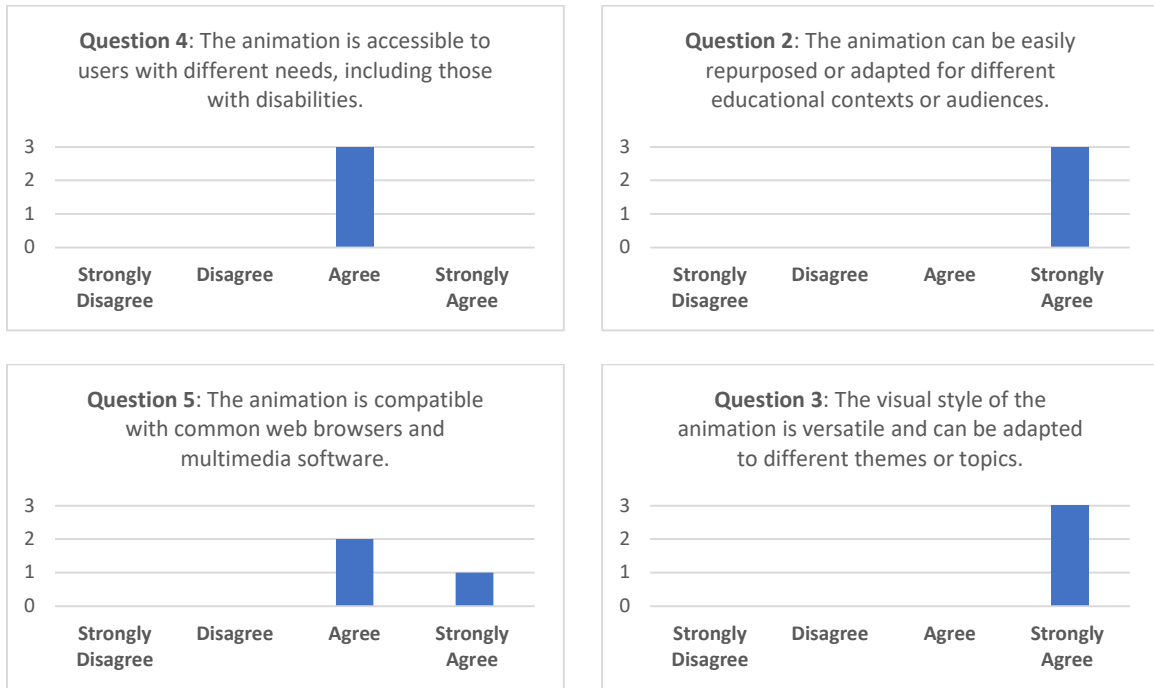


Figure 7: Results of Effectiveness by Multimedia Experts

4.1.3 Chart of Flexibility for Multimedia Experts

Multimedia professionals did not agree on how flexible they should be. The animation’s versatility in diverse instructional contexts and its visual aesthetic were acknowledged as suitable for multiple learning environments. The ease of tweaking or altering the animation’s content has elicited concerns. Despite these constraints, the experts agreed that the animation can enable scalability for future improvements and can incorporate other multimedia elements. Figure 8 summarizes the multimedia experts’ responses regarding the flexibility of the animation. Table 6 summarizes the key feedback collected from the multimedia experts.

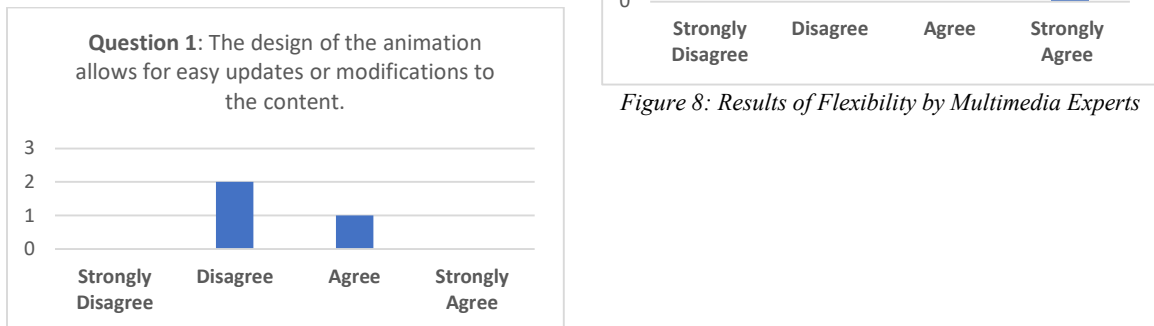


Figure 8: Results of Flexibility by Multimedia Experts

Table 6: Result Summary for Multimedia Expert

Question Type	Strongly Disagree	Disagree	Agree	Strongly Agree	Total
Content	-	6.67%	40%	53.33%	100%
Effectiveness	-	13.33%	40%	46.67%	100%
Flexibility	-	13.33%	13.33%	73.33%	100%
Total	-	11.11%	31.11%	57.78%	100%

4.2 Subject Matter Experts

Four experienced Bahasa Melayu educators served as subject matter experts in this evaluation. Using structured questionnaires, they provided informed feedback on the instructional effectiveness of the interactive 2D animation. The results were analyzed and presented graphically to examine its role in supporting the learning of Golongan Kata.

4.2.1 Chart of Content for Subject Matter Experts

Four subject matter experts with a wealth of knowledge in teaching Bahasa Melayu assessed the interactive 2D animation's content. The evaluation results were overwhelmingly positive, with all experts agreeing that the information presented in the animation is precise and closely aligned with the curriculum. This suggests that the animation offers students trustworthy and timely educational content.

Additionally, the experts agreed that the animation's examples effectively illustrate the different categories of Golongan Kata. This mutual comprehension implies that the content is not only precise but also well-organized and readily comprehensible. Consequently, the animation serves as a practical and valuable educational resource for both students and educators. The findings from the subject matter experts' content evaluation are summarized in Figure 9.

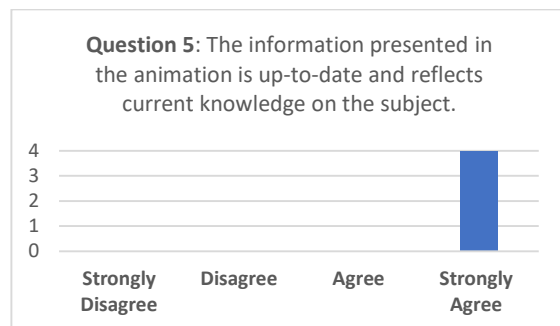
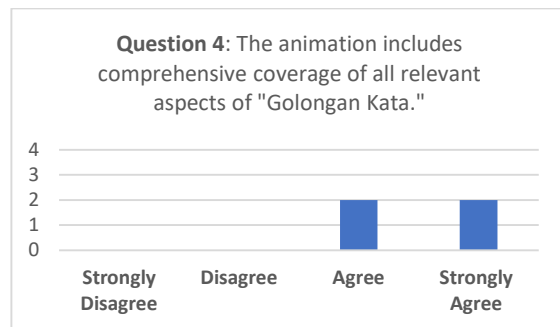
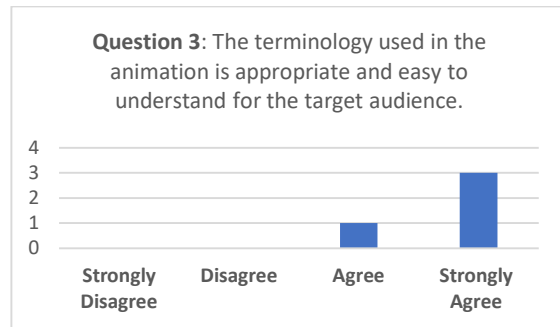
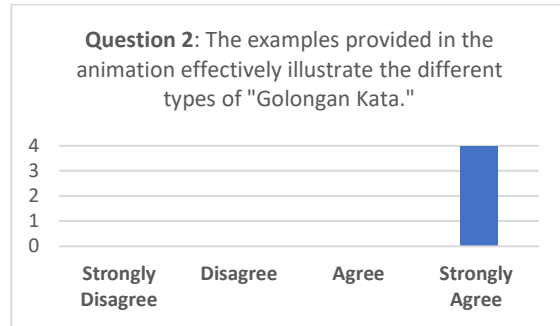
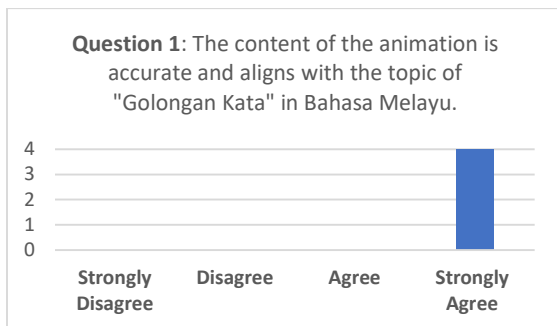


Figure 9: Result of Content by Subject Matter Experts

4.2.2 Chart of Effectiveness for Subject Matter Experts

The animation's efficacy was highly regarded by the subject matter experts. All four expressed their agreement that it effectively captivates students' attention and maintains their engagement, thereby facilitating the process of

learning and comprehension as they advance through the courses.

Moreover, the experts emphasized that the learning objectives of the animation were distinctly articulated and well accomplished. This signifies that the animation effectively communicates the fundamental components of Golongan Kata in a manner that is both memorable and comprehensible to students. The visual and auditory components were commended for augmenting the overall learning experience, rendering the content more interesting, accessible, and pleasurable. The results of the subject matter experts' assessment of the animation's effectiveness are shown in Figure 10.

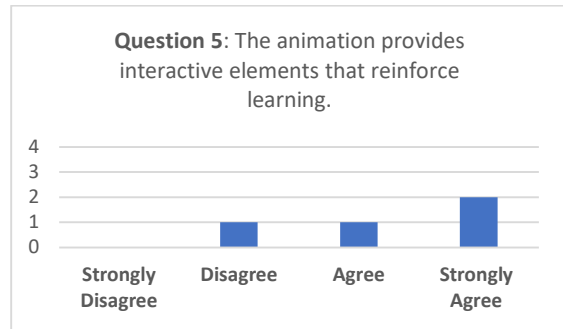
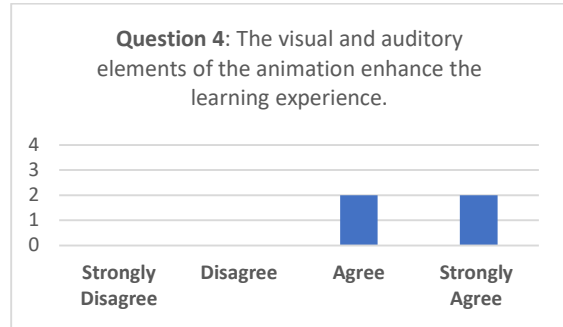
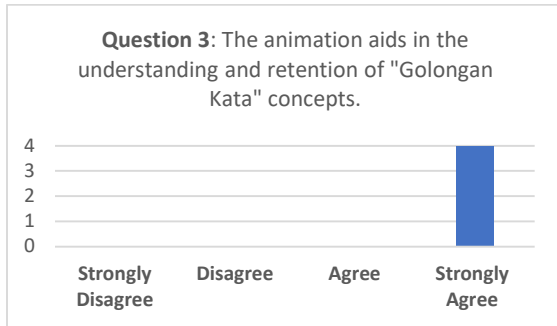
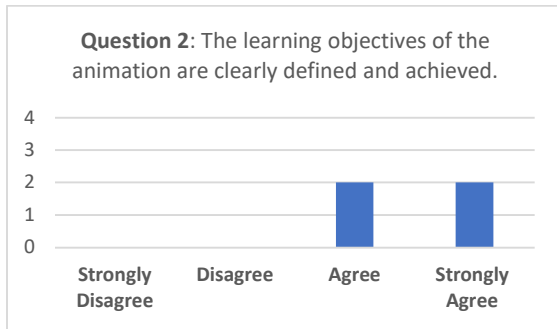
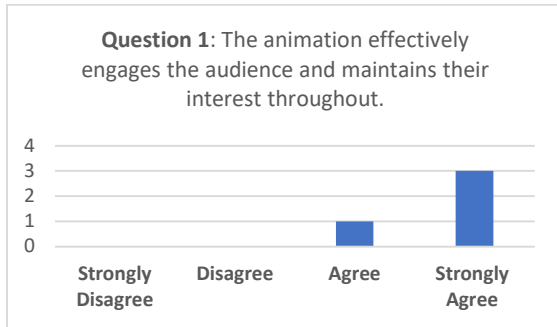


Figure 10: Result of Effectiveness by Subject Matter Experts

4.2.3 Chart of Flexibility for Subject Matter Experts

Flexibility was an additional critical factor assessed by the subject matter experts. The experts agreed that the 2D animation is highly adaptable and can be used effectively in a wide range of educational settings, which is a clear advantage. This adaptability enables the animation to be utilized in diverse educational contexts, whether integrated into a formal classroom lecture or employed as an autonomous learning tool.

According to the experts, the animation works well for students of various ages and educational levels, which makes it a versatile resource that can adapt to a wide range of learning situations. However, there was a lack of consensus regarding the simplicity of updating or modifying the content. Half of the experts believed that the animation could be readily modified to incorporate new information or changes, while the other half suggested that further improvements were necessary in this area. Ensuring that the animation remains pertinent and current, this feedback offers valuable guidance for future updates. A summary of all findings is provided in Table 7, and the results of the flexibility evaluation by the subject matter experts are depicted in Figure 11.

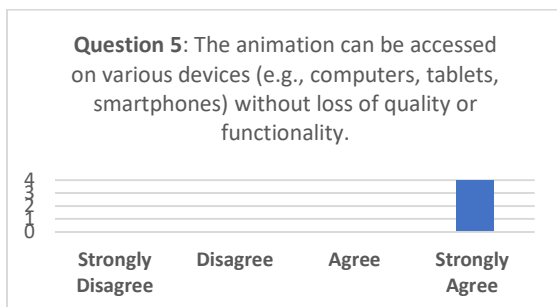
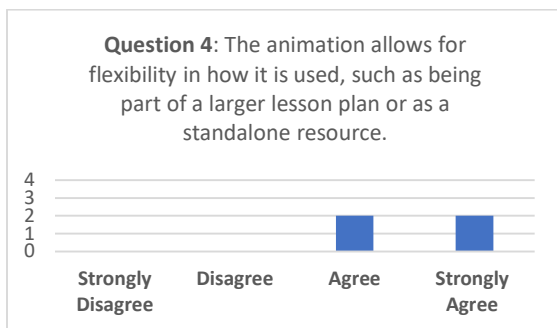
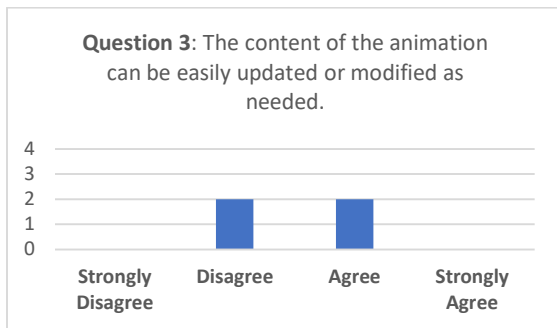
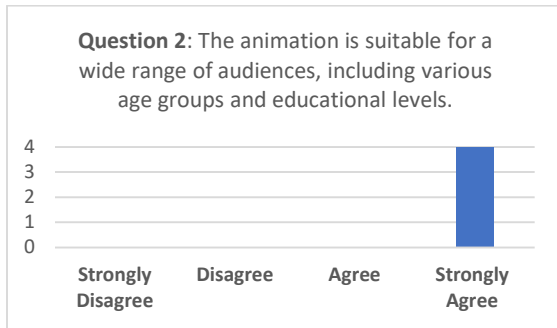
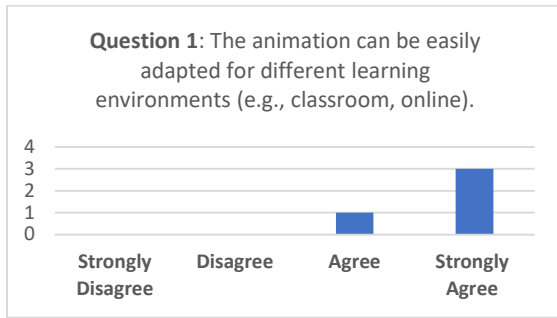


Table 7: Result Summary for Subject Matter Expert

Question Type	Strongly Disagree	Disagree	Agree	Strongly Agree	Total
Content	-	-	15%	85%	100%
Effectiveness	-	5%	30%	65%	100%
Flexibility	-	10%	25%	65%	100%
Total	-	5%	23.33%	71.67%	100%

4.3 Students

A total of 30 students currently studying Bahasa Melayu, with a focus on the topic Golongan Kata, participated in the evaluation of the interactive 2D animation. The students were drawn from several different schools, providing a range of learning experiences and perspectives. Their feedback played an important role in assessing how effectively the animation supports learning compared with traditional textbook-based instruction. Data were collected through a structured questionnaire in which students reflected on and compared their learning experiences using the 2D animation and conventional textbooks.

4.3.1 Chart of Efficiency for Students

The findings suggest that most students regarded 2D animation as a more effective approach for learning Golongan Kata than exclusively using a textbook. Specifically, 24 of the 30 students reported that the animation enhanced their understanding of the material more swiftly. This suggests that the clear visuals and structured delivery of the animation enhanced students' understanding of key subjects, allowing for more efficient learning and better utilization of their study time. Figure 12 depicts the results based on learning efficiency.

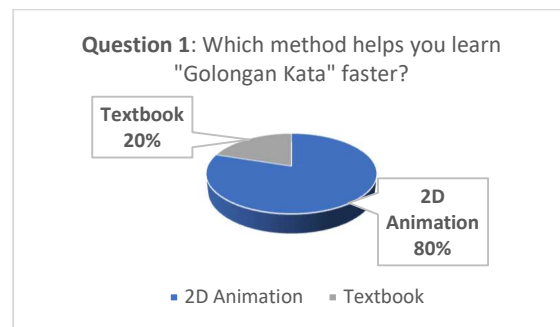


Figure 11: Result of Flexibility by Subject Matter Experts

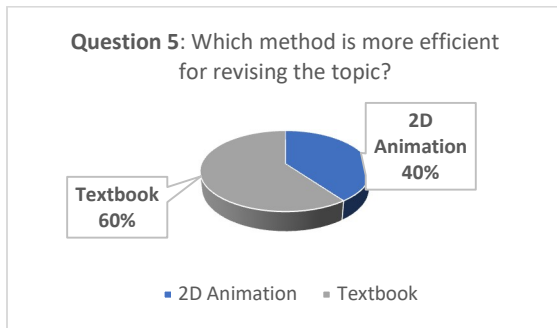
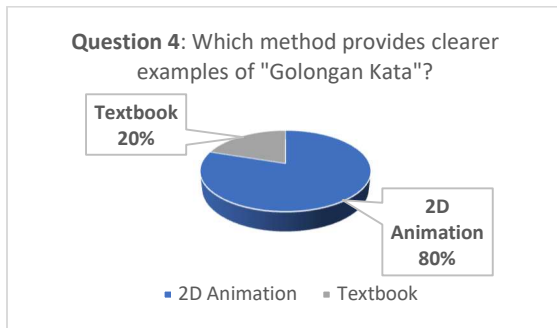
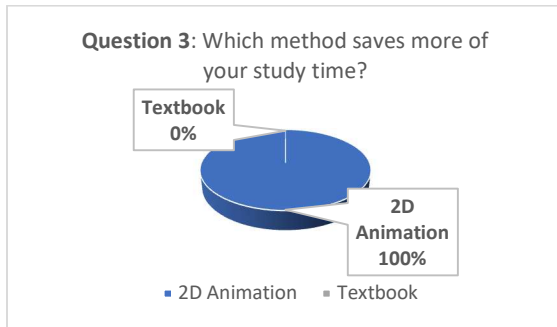
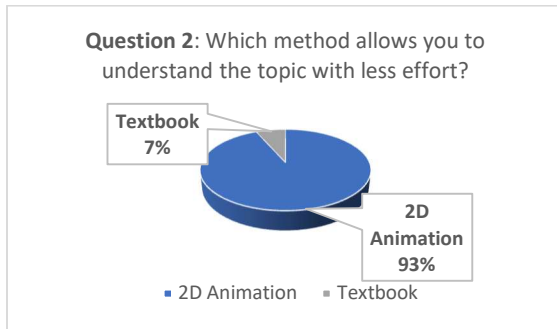
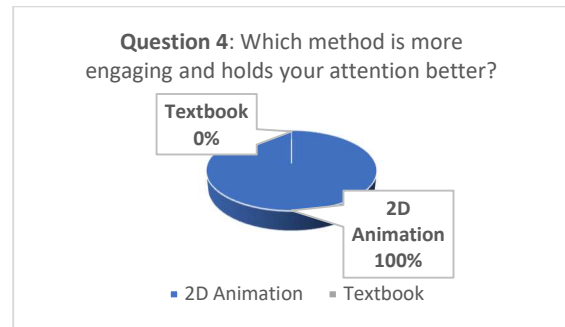
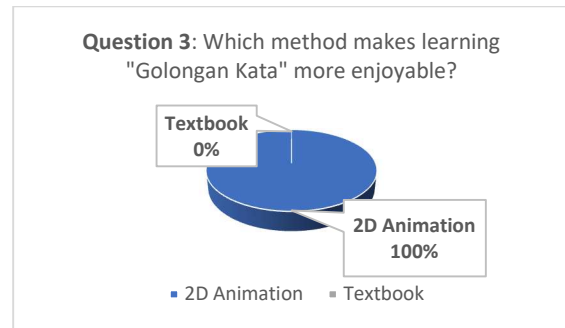
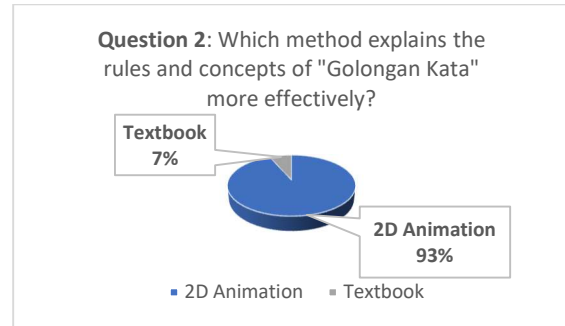
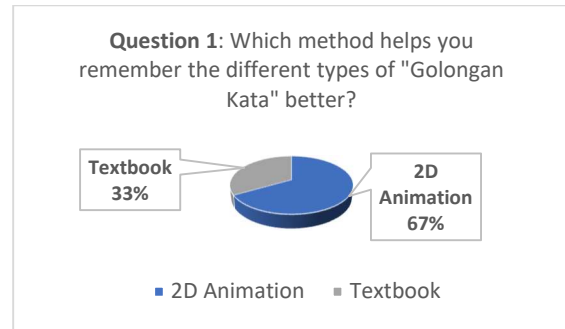


Figure 12: Result of Efficiency by Students

4.3.2 Chart of Effectiveness for Students

In terms of effectiveness, the 2D animation also received strong positive responses from students. A significant majority, 28 of 30 participants indicated that the animation elucidated the principles and concepts of Golongan Kata more effectively than the textbook. Furthermore, all

participants concurred that the animation enhanced the enjoyment of the learning experience. This heightened enjoyment may have facilitated enhanced engagement and improved retention of the material. Figure 13 illustrates the effectiveness as perceived by students.



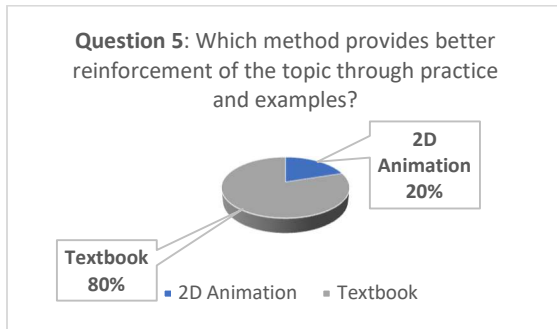


Figure 13: Result of Effectiveness by Students

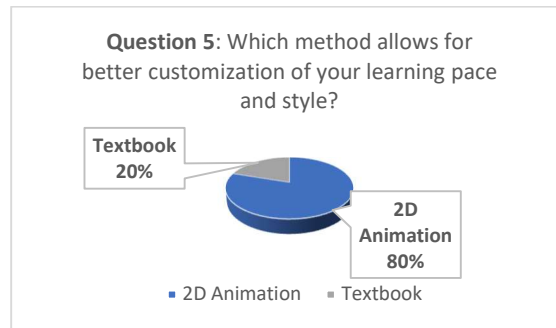
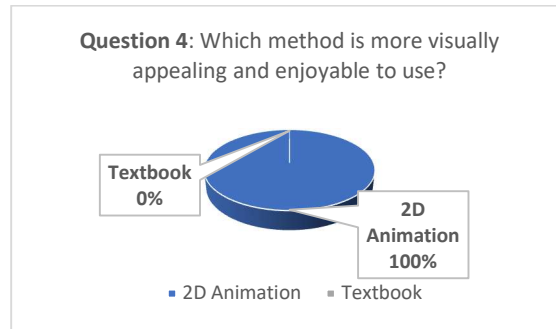
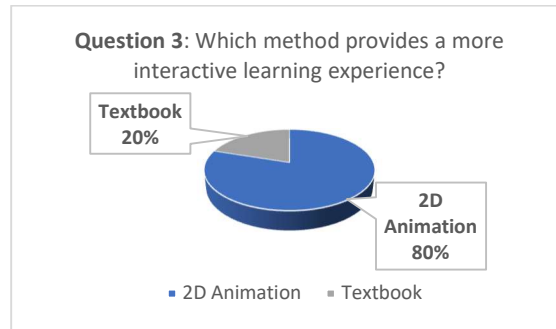


Figure 14: Result of User Interface by Students

4.3.3 Chart of User-Interface for Students

Most of the comments on the 2D animation’s user interface were positive. Most of the students said that the animation was easier to use and looked better than regular textbooks. The interactive features made the learning experience better by letting the students interact with the material at their own pace. The findings show that the animation’s interface makes it easier to use and keeps learners interested. Figure 14 displays the results of the user interface review conducted by students, and Table 8 summarizes the conclusions of the student testing.

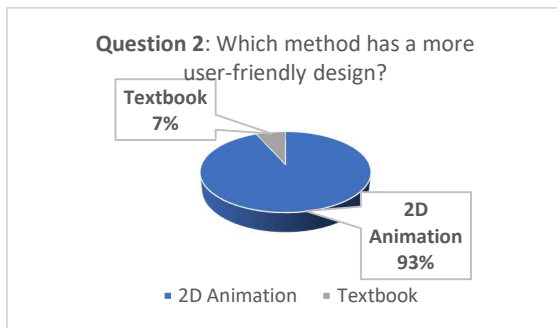
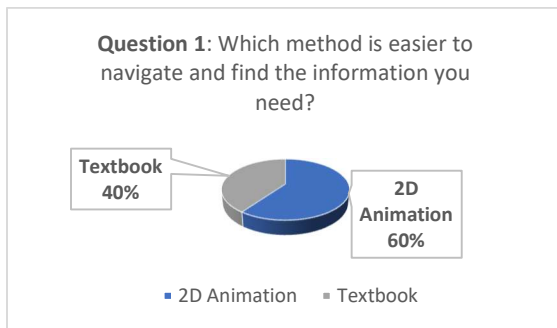


Table 8: Result Summary for Students

Question Type	2D Animation	Textbook	Total
Efficiency	78.67%	21.33%	100%
Effectiveness	76%	24%	100%
User-Interface	82.67%	17.33%	100%
Total	79.11%	20.89%	100%

5. DISCUSSION

This study introduces several significant distinctions from previous research on animation-based language acquisition. Previous research often shows that animation can improve engagement and understanding, but it does not always focus on a complete system built around a specific topic. In this

case, the study goes a step further by designing, developing, and evaluating an interactive 2D animation specifically for Golongan Kata in Bahasa Melayu. It also considers feedback from experts and students, giving a more well-rounded view of its effectiveness. This research is valuable due to its practical, curriculum-focused approach, which demonstrates how a system that is attentively designed can not only facilitate learning but also make it engaging and meaningful for students.

The evaluation of the interactive 2D animation designed for teaching Golongan Kata in Bahasa Melayu demonstrates its considerable potential to enhance the overall educational experience. A principal advantage of utilizing 2D animation in this context is its ability to transform abstract grammatical concepts into concrete and engaging representations. The animation visually represents grammatical categories and their practical usage, aiding students in linking academic knowledge to real-world application. This method fosters active learning and enhances recall of intricate topics by delivering knowledge in a dynamic, accessible, and relatable style.

The animation incorporates several multimedia elements, including vivid imagery, fluid text transitions, and engaging audio, to create a learning experience that is both unified and appealing. These characteristics facilitate student engagement and enhance the comprehensibility of the grammatical content. Simultaneously, input from the subject matter experts identified other areas for enhancement in the animation. Particularly, many aspects did not fully correspond with the textbook content, potentially resulting in deficiencies in students' understanding if the animation is employed in isolation. The experts noted the absence of interactive exercises and practice questions, which are crucial for allowing students to apply their knowledge and evaluate their understanding. Enhancing these elements in subsequent versions could augment the animation's efficacy as an educational instrument.

These issues could be addressed by updating the animation to better align with the textbook, ensuring that all important ideas are covered in sufficient detail. With interactive elements like scenario-based exercises or quick tests, students could interact with the content more actively and get immediate feedback on their understanding. Additionally, Bahasa Melayu subtitles would help learners who benefit from reading along while watching by reinforcing the concepts in a more approachable way and enhancing their comprehension.

Using 2D animation in the classroom presents a number of challenges that must be acknowledged. Teachers' familiarity with the tools, students' access to technology, and the extent to which the content aligns with the curriculum can all influence the effectiveness of the animation. Different teaching styles and individual learning preferences may also affect its impact. For the animation to be most effective in promoting engagement and comprehension, it should be customized to the developmental levels and learning requirements of students.

While the results show that the 2D animation improved engagement and understanding of Golongan Kata, some unintended outcomes were observed, including limited interactivity and minor gaps in content alignment with the textbook. In comparison with existing literature, these findings support prior research demonstrating that multimedia tools enhance engagement and comprehension. However, unlike studies that emphasize fully interactive features, the results in this study indicate that limited interactivity may restrict deeper engagement, suggesting that adding more interactive elements could enhance future versions.

The findings underscore the significance of interactive digital technologies in the contemporary educational landscape. The utilization of 2D animation provides educators with a straightforward and efficient method to convey intricate grammatical principles, facilitating student comprehension and engagement. As digital and blended learning expand, tools such as this can complement traditional teaching approaches to facilitate more student-centered learning. Adding interactive features can also encourage greater participation and allow students to receive immediate feedback which helps reinforce their understanding. Overall, these findings suggest that interactive animation can be a useful and practical resource for educators, curriculum developers, and educational technology practitioners looking to improve language learning outcomes.

Despite the promising results, this study has certain limitations that require recognition. The level of interaction in the animation is limited, potentially reducing opportunities for active learning and immediate feedback. Moreover, the content predominantly centers on Golongan Kata, hence constraining its applicability to other domains of Bahasa Melayu. The sample size, especially for expert assessment, is comparatively limited and may not adequately reflect wider viewpoints. Moreover, the efficacy of the animation is contingent upon

availability to suitable technology, which may not be uniformly accessible across all educational settings. These constraints indicate opportunities for enhancement and offer guidance for subsequent investigations.

In conclusion, the 2D animation designed for teaching Golongan Kata exhibits considerable potential to improve student involvement and understanding. Simultaneously, there exists potential for enhancement. By addressing content deficiencies, incorporating interactive elements, and integrating supplementary support features, the animation could evolve into a more comprehensive and efficacious educational resource. Continued research and the exploration of creative teaching approaches will be important to fully harness the benefits of 2D animation, helping it become a valuable and practical resource in the classroom.

6. CONCLUSION

The 2D animation that was created to instruct Golongan Kata in Bahasa Melayu exhibits both areas for further improvement and evident strengths. The animation's straightforward presentation and vibrant visuals captivate students, rendering complex grammatical concepts more accessible and easily comprehensible. Particularly among younger learners, its visual allure contributes to sustained engagement, and feedback from subject matter experts confirms that the animation effectively communicates the fundamental concepts of Golongan Kata.

The work simultaneously identifies multiple areas for enhancement to augment its educational efficacy. The lack of interactive aspects restricts students' chances to actively engage with the material. In the absence of features like quizzes or decision-making activities, learners forfeit crucial hands-on experiences that enhance comprehension. The lack of integrated practice questions or exams impedes the assessment of students' understanding of the subject matter.

Another area for improvement is achieving an appropriate balance of intellectual content and visual appeal. The animation's vivid and captivating visuals are a significant asset; however, there is a risk that the emphasis on aesthetics may overshadow a more in-depth examination of the subject matter. Prioritizing educational content is crucial for ensuring students achieve a comprehensive knowledge. In addition, adding a wider variety of learning tools and activities could help meet different learning styles and preferences, making the

animation more inclusive and effective for all learners.

The animation's effectiveness as a learning tool could be improved by incorporating interactive elements and practical exercises in the future. These may encompass quizzes, decision-making scenarios, or mini-games pertaining to Golongan Kata, providing students an opportunity to actively engage with the content and receive immediate feedback on their comprehension. Simultaneously, achieving an optimal equilibrium between striking visuals and a comprehensive examination of the material will facilitate students' acquisition of a profound and significant grasp of the subject matter.

The objective of this investigation was to develop and evaluate an interactive 2D animation that would aid in the acquisition of Golongan Kata in Bahasa Melayu. The results demonstrate that the animation effectively enhanced student engagement, comprehension, and learning efficiency relative to conventional techniques. Research indicates that interactive 2D animation is a valuable supplementary educational instrument; however, additional modifications are necessary to enhance its learning potential.

Overall, the work has successfully produced a resource for teaching Golongan Kata that is both aesthetically pleasing and readily available. Concurrently, there is potential to enhance the animation's effectiveness. The animation could be transformed into a more comprehensive learning aid by improving interactivity, incorporating assessment opportunities, and deepening the content. This would provide students with a more engaging, meaningful, and rich experience as they study Bahasa Melayu.

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