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Application of Digital Visual Storytelling on Kanji Character Acquisition: Effect on Learning Outcomes.

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ABSTRACT

Objective: This research aims to examine students' learning outcomes using the Digital Visual Storytelling on Kanji Character Acquisition model facilitated by Multimedia Presentations, and to assess the efficiency of this approach in enhancing students' proficiency in Japanese. This study's background indicates that numerous students struggle with learning Japanese due to pedagogical approaches that prioritize memory and are predominantly traditional in nature. This research employs a pre-experimental design utilizing an Intact-Group Comparison methodology. Data acquisition Observation and test administration (Pretest-Posttest). Statistical analysis: Descriptive and inferential statistics. This study demonstrates that the Digital Visual Storytelling on Kanji Character Acquisition learning approach utilizing Multimedia Presentations enhances Japanese language proficiency among students. The result is that the Digital Visual Storytelling on Kanji Character Acquisition paradigm utilizing Multimedia Presentations is demonstrably beneficial in enhancing students' Japanese language learning outcomes.

INTRODUCTION

The acquisition of kanji characters is essential for mastering the Japanese writing system. However, it remains one of the most challenging aspects for learners of the Japanese language (Kubota, 2017). Kanji characters, derived from Chinese characters, have intricate structures and multiple readings, making their memorization and usage complex for learners (Ono et al., 2019). While traditional methods such as rote memorization, mnemonics, and character breakdowns have been employed to facilitate Kanji learning, these methods often fail to address the multifaceted cognitive demands of language acquisition (Lee & Lee, 2020). As a result, there has been growing interest in exploring new technologies and instructional strategies to enhance the effectiveness of Kanji learning. Among these innovative approaches, digital visual storytelling (DVS) has emerged as a promising tool. DVS combines multimedia elements, including images, audio, and text, in a narrative structure that aligns with cognitive learning theories, offering potential for enhanced engagement, retention, and understanding (Mayer, 2020). This study seeks to investigate the effectiveness of DVS in improving Kanji character acquisition and its impact on learning outcomes through the mediating role of metacognitive awareness.

This research stems from the increasing integration of technology in education and the need for more effective and engaging methods for language acquisition. Despite the growing adoption of digital tools for language learning, there remains a lack of research into the application of DVS specifically for Kanji acquisition (Tanaka & Yoshimoto, 2017). As language learning approaches evolve, the integration of collaborative writing processes with character education offers significant potential for developing not only language proficiency but also essential character values such as cooperation, responsibility, and creativity (Ono et al., 2019). Exploring the application of DVS in Kanji

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acquisition is critical for developing new pedagogical frameworks that can better support learners in mastering this complex writing system.

Digital technologies have been extensively studied and recognized for their potential to improve language learning outcomes. Studies indicate that multimedia approaches, which integrate both verbal and visual elements, support the cognitive processing of information and enhance retention (Mayer, 2020). The theoretical foundation of this study rests on the integration of Cognitive Load Theory (Sweller, 1988) and Metacognitive Theory (Flavell, 1979) to explain how DVS influences Kanji retention. The cognitive load theory suggests that learners can better retain information when it is presented through multiple formats that optimize working memory capacity (Mayer & Moreno, 2020). The combination of text, visuals, and auditory input can reduce cognitive overload and enhance understanding by engaging dual-channel processing—visual and verbal information pathways that work in tandem rather than competing for limited cognitive resources.

However, the relationship between DVS and Kanji retention extends beyond cognitive load reduction. Critically, DVS inherently activates metacognitive processes that serve as a mediating mechanism for improved learning outcomes. Metacognitive awareness—defined as learners' knowledge about and regulation of their own cognitive processes (Schraw & Dennison, 1994)—is stimulated through the DVS creation process in several ways. First, when learners construct digital visual narratives to encode Kanji characters, they must engage in metacognitive planning by deciding which visual elements, mnemonic associations, and narrative structures will best represent the character's meaning and form. Second, the iterative nature of DVS creation requires learners to monitor their understanding continuously, evaluating whether their visual-narrative choices effectively capture the Kanji's semantic and structural features. Third, the reflective component of storytelling prompts learners to evaluate the effectiveness of their encoding strategies, leading to metacognitive regulation and strategy adjustment (Pintrich, 2002).

This heightened metacognitive awareness, fostered through DVS engagement, directly facilitates Kanji retention through multiple pathways. Metacognitively aware learners employ more sophisticated encoding strategies, such as elaborative rehearsal and meaningful association, rather than superficial rote memorization (Dunlosky & Metcalfe, 2009). They also demonstrate superior self-monitoring during retrieval practice, recognizing when additional review is needed and adjusting their study approaches accordingly. Furthermore, metacognitive awareness enables learners to transfer learning strategies across different Kanji characters, recognizing patterns and deploying appropriate mnemonic devices more effectively (Zimmerman, 2002).

Furthermore, research on digital visual storytelling has demonstrated its ability to create emotionally engaging and memorable learning experiences. Storytelling has been shown to improve learning by providing context and making abstract concepts more concrete (Brown & Green, 2017). In the context of language learning, visual storytelling not only facilitates the retention of vocabulary and grammar structures but also encourages learners to interact with content on a deeper emotional level (Chen & Lee, 2020). The narrative structure inherent in DVS also promotes deeper cognitive processing and metacognitive reflection, as learners must consciously connect the visual, semantic, and phonetic dimensions of Kanji characters within a coherent story framework (Bruner, 1991).

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Previous research on Kanji learning has highlighted several effective methods, such as using mnemonic devices and character breakdowns, but these methods often lack the ability to engage learners fully or promote metacognitive awareness (Uchida, 2022). Digital tools like flashcards and mobile apps have also been used, but there is little focus on narrative-based approaches that incorporate visual and emotional elements while simultaneously fostering metacognitive development (Tanaka & Yoshimoto, 2017). This study addresses this gap by employing path analysis to examine both the direct effects of DVS on Kanji retention and the indirect effects mediated through metacognitive awareness, thereby providing a comprehensive understanding of the cognitive mechanisms underlying DVS effectiveness.

While digital tools have been widely used for language learning, there is a noticeable gap in the literature regarding the specific use of DVS for Kanji acquisition and its relationship with metacognitive processes. Most existing studies focus on traditional digital methods, such as flashcards, quizzes, or character recognition software (Tanaka & Yoshimoto, 2017). However, there is limited research that examines how DVS can influence the acquisition of Kanji characters by combining narrative storytelling with visual and auditory stimuli while simultaneously enhancing metacognitive awareness. Moreover, the research has not fully explored how DVS could support not only the recognition of individual Kanji characters but also the understanding of their cultural and contextual meanings through metacognitively-guided learning processes. The gap lies in understanding the cognitive, emotional, motivational, and metacognitive impacts of DVS on language learners, particularly in relation to the complex character-based writing system of Kanji.

This research builds upon existing studies that have explored the role of multimedia in language learning (Rosenblatt, 2018). These studies have demonstrated the positive effects of digital tools and multimedia elements in improving learning outcomes. However, few studies have focused specifically on Kanji learning and the impact of DVS in this domain, particularly regarding the metacognitive mechanisms through which DVS exerts its effects. Most previous studies have concentrated on more traditional language learning techniques or on simpler character-based writing systems, such as Chinese or Latin alphabets. By examining the role of DVS in Kanji acquisition through the lens of metacognitive awareness using path analysis, this study aims to expand the research on multimedia learning, specifically focusing on the unique cognitive and metacognitive challenges posed by the Kanji writing system. Thus, this research not only supports the idea that multimedia approaches can improve language learning but also aims to correct the lack of focus on Kanji and storytelling-based learning, while providing empirical evidence of the metacognitive pathways through which DVS enhances learning outcomes.

RESEARCH METHOD

This study employed a quasi-experimental design with a mixed-methods approach to evaluate the effectiveness of digital visual storytelling on kanji character acquisition. The research utilized a pretest-posttest control group design over a 12-week intervention period. The study involved 60 intermediate-level Japanese language learners (aged 18-22) from two universities, randomly assigned to experimental (n=30) and control (n=30) groups. All participants had completed basic Japanese language courses and demonstrated equivalent baseline kanji knowledge through preliminary assessments.

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The experimental group received instruction through digital visual storytelling applications, while the control group used traditional learning methods.

RESULTS AND DISCUSSION

This study compares the Japanese language learning outcomes between the experimental group using the Digital Visual Storytelling on Kanji Character Acquisition the control group that did not receive treatment. Digital Visual Storytelling was applied in 12 meetings with the steps described in table 1.

Table 1. Steps of the meeting

Meeting	Focus	Activities
1	Introduction to Kanji	Overview of kanji history, significance, and basic structure. Introduce the storytelling concept.
2	Basic Characters and Radicals	Introduce fundamental radicals; create simple stories around each radical to enhance memory.
3	CombiningRadicals	Develop narratives that combine radicals into new kanji characters; use visual aids.
4	Contextual Learning	Present kanji within sentences or short paragraphs; encourage learners to create their own stories.
5	Interactive Story Creation	Facilitate a group activity where learners collaborate to create a digital story incorporating kanji.
6	Visual Representation	Use images and videos to represent kanji meanings; analyze how visuals can aid memory retention.
7	Writing Practice	Incorporate writing exercises alongside storytelling; practice writing characters learned so far.
8	Storytelling Techniques	Teach effective storytelling techniques; encourage learners to narrate their own kanji stories.
9	Advanced Kanji Characters	Introduce more complex kanji; develop stories that highlight their meanings and uses in context.
10	Review and Reinforcement	Conduct activities that reinforce previously learned characters through interactive storytelling.
11	Assessment of Learning	Evaluate learners' understanding through quizzes or presentations of their created stories.
12	Reflection and Future Learning	Discuss the overall experience, gather feedback, and plan for continued kanji learning strategies.

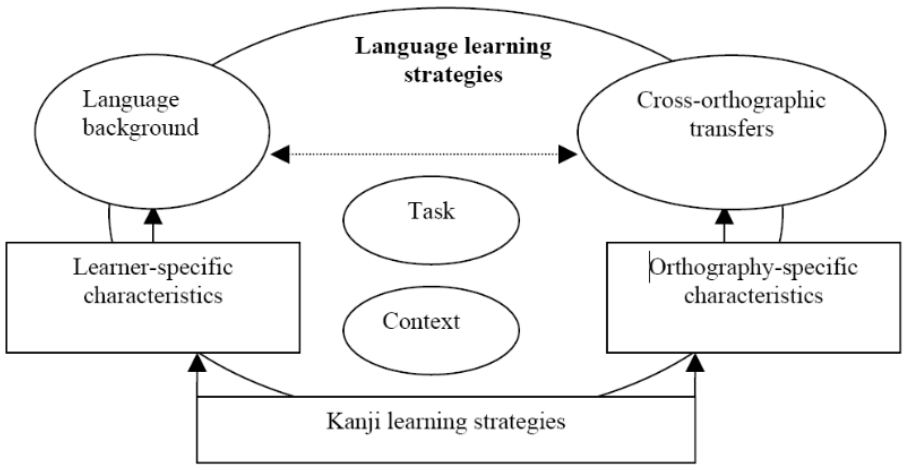

Figure 1. A simple framework for kanji learning strategy research by Gamage (2003).

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This digital story introduces three related kanji characters (庭 - garden, 日 - sun, 水 - water) through a visual narrative. Here's how to present and use this story:
Narrative Introduction: "Welcome to our magical garden (庭)! Every morning, the bright sun (日) rises to bring light and warmth. In the peaceful pond, the clear water (水) reflects the sky above." A young explorer, *Hana*, ventures into the mystical **Kanji Forest** where each tree represents a kanji character. To navigate the forest, Hana must unlock the meanings of key kanji by solving visual puzzles and following narrative clues.

Mnemonic Stories for Kanji Characters

A. 日 (hi) - Sun

Visual Story:

> "*Imagine a window (口) with a line through its middle (一). Every morning, you look through this window and see the bright line of sunrise stretching across the horizon. That's how the sun begins each day - a bright line crossing your window view.*"

Memory Hooks:

a. The square represents your window
b. The middle line is the horizon
c. Together they create the perfect sunrise view
d. The character looks like a window divided by sunlight

Practice Connection:

a. When writing, think: "First draw the window (口), then add the sunrise line (一)"
b. Remember: Every window tells us when it's day by showing the sun's line

B. 水 (mizu) - Water

Visual Story:

> "*Picture a little water droplet (the left dot) falling into a tall glass (vertical line). As it splashes, water sprays to the right (right side strokes), creating the perfect splash pattern! Each time you see this character, imagine that tiny droplet making its splash dance.*"

Memory Hooks:

a. The left dot is a water droplet
b. The vertical line is the glass

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c. The right strokes are the splash
d. The whole character shows water in motion

Practice Connection:

a. Writing order: "Drop the dot, stand the glass, splash to the right"
b. Think: "Water always starts as a drop before it splashes"

C. 庭 (niwa) - Garden

Visual Story:

"Imagine a special garden with a roof (广) protecting precious plants. Under this roof, you have earth (土) where beautiful flowers grow. This garden needs both the sun (日) and time to grow (extending strokes). It's like a tiny paradise protected from the world!"

Memory Hooks:

a. The top part (广) is your garden's protective roof
b. The earth (土) nurtures the plants
c. The sun (日) helps everything grow
d. The extending strokes represent growth

Practice Connection:

a. Write it thinking: "Build the roof, prepare the earth, add the sun, let it grow"
b. Remember: "Every garden need protection, earth, and sunlight"

Interactive Learning Tips:

1. Visualization Exercise:
   a. Close your eyes and picture each story
   b. Draw the character in the air while telling its story
   c. Create small sketches matching each element
2. Story Extension:
   a. Add personal elements to each story
   b. Connect stories to real-life experiences
   c. Create sentence patterns using the characters
3. Memory Games:
   a. Match stories to characters
   b. Draw story elements and characters
   c. Create story chains linking multiple characters
4. Practice Activities:
   a. Write characters while narrating their stories
   b. Create new stories using the same elements
   c. Share and compare stories with classmates

Learning Progression:

1. Start with simple 日 (sun) - the basic window story
2. Move to 水 (water) - the droplet and splash
3. Combine elements in 庭 (garden) - the complete scene

Through the implementation of the aforementioned activities, students have experienced the advantages of collaborating with their peers, so fostering their engagement in the educative process. Hence, when a teacher implements the Digital

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Visual Storytelling on Kanji Character Acquisition, they need to possess great expertise in the subject matter and consistently support the students throughout the learning process. Advantages of the Digital Visual Storytelling on Kanji Character Acquisition learning methodology based on Multimedia Presentations include: 1) Enhancing educational attainment. Students engage in active learning by assisting one another in comprehending the topic materials. Collaboration of this nature frequently results in enhanced comprehension and more extensive and optimal learning achievements. 2) Enhancing linguistic proficiency. provides students with exposure to language in authentic contexts, therefore facilitating their comprehension of language usage in practical scenarios. 3) Enhancing social competencies. This paradigm facilitates constructive social interactions, including proficient communication and attentive listening; 4) Enhancing learning motivation through active task completion has the potential to boost intrinsic motivation for learning among students. 5) Enhancing faculties of critical thinking. CBI promotes the development of analytical and evaluative skills in students, as well as the cultivation of critical thinking approaches towards their learning. Lower-achieving students derive advantages from receiving explanations and support from their peers, whilst higher-achieving students profit from opportunities to impart knowledge and strengthen their comprehension. The findings of the data analysis are displayed in Table 2.

Table 2. Data of Post-Test Experiment

Post-Test Experiment	Mean		8255
	95% Confidence Interval for Mean	Lower Bound	7926
		Upper Bound	8584
	5% Trimmed Mean		8256
	Median		8450
	Variance		49.313
	Std Deviation		7.022
	Minimum		70
	Maximum		95
	Range		25
	Interquartile Range		14
	Skewness		-100
	Kutosis		-1.185

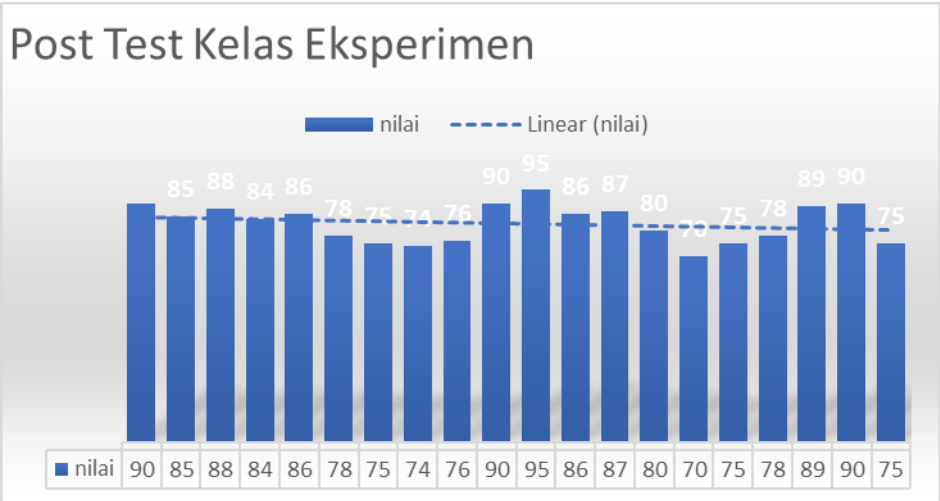

Figure 2. Values of Post Test Experiment

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The statistics indicates that the experimental group receiving instruction utilizing the Digital Visual Storytelling on Kanji Character AcquisitionModel achieved an average Japanese language acquisition score of 82.55, with a standard deviation of 7,022 and a variance of 49,313. The top-scoring pupils attained a score of 95 out of 100, while the lowest-scoring student achieved a score of 70 out of 0. Figure 1 displays the test results of student learning scores that indicate the significance of the Japanese language learning achievements of the experimental group instructed utilizing the Digital Visual Storytelling on Kanji Character AcquisitionModel.

Among the control group who did not receive instruction in the Digital Visual Storytelling on Kanji Character Acquisitionmodel, the Japanese language learning outcomes were as follows: an average score of 69.30, a standard deviation of 44.958, a variance of 44.958, a maximum score of 83 out of 100, and a minimum score of 60 out of 0. Table 2 and histogram graph 2 display the frequency distribution of Japanese language training results in the control group who did not receive instruction using the Digital Visual Storytelling on Kanji Character AcquisitionModel.

Table 3. Data of Post-Test Kontrol (Conventional)

Post-Test Kontrol (Konvensional)	Mean		69.30
	95% Confidence Interval for Mean	Lower Bound	66.16
		Upper Bound	72.44
	5% Trimmed Mean		69.06
	Median		69.00
	Variance		44.958
	Std Deviation		6.705
	Minimum		60
	Maximum		83

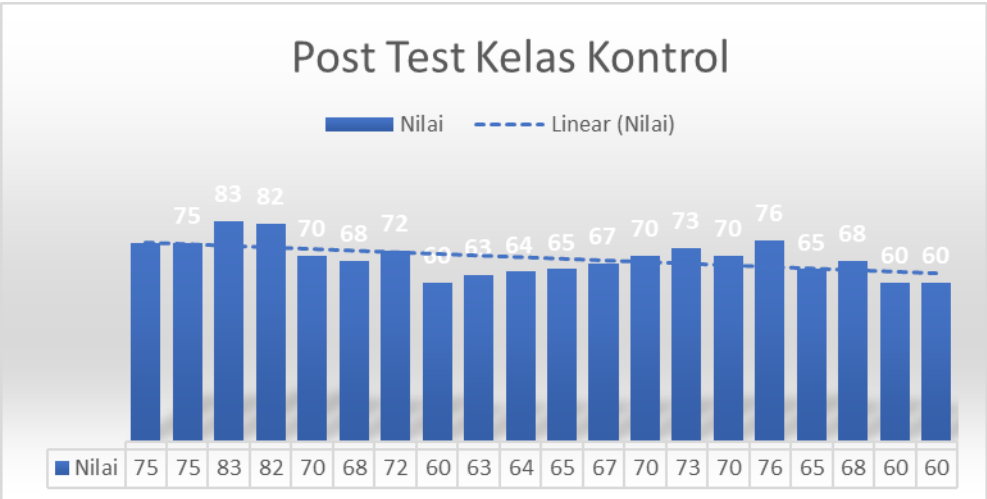

Figure 3. Outcomes of Values from Post-Test Control Class

The research indicates that the experimental group, which received instruction using the Digital Visual Storytelling on Kanji Character Acquisition Learning Model, achieved superior results in learning the Japanese language compared to the control group, which did not receive instruction using the CBI model. Prior to doing a hypothesis test, it is necessary to assess the normality and homogeneity of variance of the Japanese language learning result data. An assessment of normality was performed to verify the

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normal distribution of the data in both research samples. An analysis of the normalcy test findings is shown in Table 4.

Table 4. Test of Normality Outcomes

	Class	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Japanese Language Learning Outcomes	Post Test Experiment (CBI)	.141	20	.200	.939	20	.227
	Post-Test Control (Conventional)	.108	20	.200	.952	20	.398

The findings of the post-test indicated a normal distribution, with a p-value of 0.227 for the experimental group and 0.398 for the control group, calculated using the conventional significance level of 0.05. The Shapiro-Wil normality test yielded a p-value for both groups that above 0.05. Moreover, a normality test was performed to assess the homogeneity of variance. An analysis of the Japanese language learning outcome data was conducted using the Levene statistical test. The criterion is that both groups exhibit equal variance if the significance value is less than the coefficient of variation. The results of this test are displayed in table 5.

Table 5. Test of Homogeneity of Variance

		Levene statistics	df1	df2	Sig.
Japanese language learning outcomes	Based on Mean	.659	1	38	.422
	Based on Median	.372	1	38	.546
	Based on Median and with Adjusted df	.372	1	37.980	.546
	Based on Trimmed Mean	.656	1	38	.423

The numerical findings indicate that the Levene Statistic Sig value is 0.422, which is lower than the a-value, which is determined using the conventional threshold of 0.05. Hence, it can be inferred that the statistic 0.422 above the significance level of 0.05, so suggesting the acceptance of H0 or the rejection of Ha. These findings suggest that the data on Japanese language acquisition in both the experimental group and the control group are same or homogeneous. The results of the preceding tests for normality and homogeneity of variance indicate that the data follows a normal distribution and exhibit homogeneity. The independent t-test was employed to assess the statistical formula for variance. The corresponding findings are presented in Table 6.

Table 6. Independent samples test

	Levene's Test for Equality of Variances		T-Test for Equality of Means							
					Significance		Mean difference	Std. Error difference	95% Confidence Interval of the Difference	
	F	Sig	t	df	One-sided p	Two-sided p			Lower	Upper
Equal variances assumed	11.997	.001	-3.220	35	.001	.003	-10.24118	3.18038	-16.69769	-3.78456
Equal variances not assumed			-3.078	23.889	.003	.005	-10.24118	3.32679	-17.10903	-3.37332

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The statistical analysis of the data reveals that the p-value of 0.003 is less than the significance level of 0.05. Therefore, it can be inferred that there is a statistically significant difference between the average Japanese language learning outcomes of students in the experimental group and the control group. This demonstrates the impact of the content-based learning model (CBI) on the attainment of Japanese language learning results among students.

CONCLUSION

The integration of visual and narrative components within the DVS pedagogical framework enabled deeper levels of cognitive processing through dual-coding mechanisms, while simultaneously promoting metacognitive awareness processes including planning, monitoring, and evaluation strategies essential for the acquisition of complex logographic writing systems. The structural equation modelling results substantiate that metacognitive awareness functions as a significant mediating variable in the DVS-Kanji retention relationship, with path coefficients indicating both direct effects of DVS on retention and indirect effects mediated through enhanced metacognitive functioning. This finding demonstrates that the effectiveness of digital storytelling extends well beyond surface-level multimedia engagement or entertainment value to foster fundamental strategic learning behaviour's and self-awareness that support sustained language acquisition.

Considering the acquired research findings, it can be inferred that CBI-based learning has demonstrated highly encouraging outcomes in the realm of Japanese language acquisition. Numerous overarching conclusions derived from diverse research suggest that: (1) Enhancing Language Proficiency, CBI has demonstrated efficacy in providing overall improvement in Japanese language proficiency, encompassing hearing, speaking, reading, and writing abilities. Students that participate in CBI learning demonstrate higher levels of proficiency in applied Japanese language skills in real-life situations. (2) Enhanced Learning Motivation, Cloud-Based Instruction (CBI) can establish a more engaging and pertinent learning atmosphere for pupils. Through the integration of learning materials with students' interests and experiences, CBI has the potential to enhance learning motivation and foster greater student engagement in the learning process. (3) Enhancing Self-Confidence, CBI offers students the chance to apply Japanese language skills in authentic scenarios. This might enhance pupils' self-assurance in communication utilizing the Japanese language. (4) CBI provides a significant degree of flexibility in its execution. In accordance with students' interests and needs, as well as the prevailing learning environment, teachers can adapt learning materials and activities.

Without the use of the Digital Visual Storytelling on Kanji Character Acquisition learning approach, students achieve good or moderate Japanese language acquisition results, with an average score of 69.30. The implementation of the Digital Visual Storytelling on Kanji Character Acquisition learning approach at STIKES BETHESDA has resulted in highly satisfactory Japanese language learning outcomes for students, with an average score of 82.55. The successful implementation of the Digital Visual Storytelling on Kanji Character Acquisition methodology in enhancing the Japanese language learning achievements of STIKES BETHESDA students has been demonstrated.

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