

Journal of Educational Sciences
Journal homepage: https://jes.ejournal.unri.ac.id/index.php/JES

P-ISSN 2581-1657
E-ISSN 2581-2203

Development of VILLA Media to Enhance Fourth-Graders' Cognitive Outcomes on Hindu-Buddhist Kingdoms

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ARTICLE INFO

Article history:

Received: 23 Jan 2026
Accepted: 29 July 2026
Available Online: 05 Aug 2026

Keywords:

ADDIE Model,
Cognitive Outcomes,
Hindu-Buddhist Kingdoms,
VILLA Media

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Article Doi:

https://doi.org/10.31258/jes.10.8.p.25-39

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A B S T R A C T

Many fourth-grade students struggle with abstract historical topics in the IPAS subject, leading to low cognitive learning outcomes. This research aims to develop, evaluate the feasibility, and test the effectiveness of VILLA (Video Lagu Anak) media in improving student understanding of Hindu-Buddhist Kingdoms. This study utilized a Research and Development (R&D) design with the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model, involving 35 students at SDN Tambakaji 01. Data were collected through expert validation sheets, interviews, and pre-test/post-test instruments. The media's feasibility was evaluated by 3 expert validators, including media, subject matter, and language experts. The results indicate that VILLA media is highly feasible, achieving an average expert validation score of 95% and a student response rate of 95%. Statistical analysis incorporating the Shapiro-Wilk normality test, Wilcoxon Signed-Rank test, and N-gain calculation showed a significant improvement in learning outcomes ($p = 0.000$). Furthermore, the N-gain score of 0.74 confirms that the media is highly effective. In conclusion, VILLA media is a valid, practical, and effective instructional tool that successfully simplifies complex historical concepts and significantly enhances the cognitive retention of fourth-grade students.

1. Introduction

As a constitutionally guaranteed fundamental right in Indonesia that ensures non-discriminatory access to shape individual growth, national independence, and character in line with Ki Hadjar Dewantara's philosophy, education serves as a lifelong formal and non-formal learning process legally mandated by Law No. 20 of 2003 and Government Regulation No. 4 of 2022 to consciously develop holistic human potential, morals, and skills which must continuously evolve alongside technological shifts, as currently exemplified by the Merdeka Curriculum's transition toward integrated, holistic learning through subjects like IPAS that engage students in exploring environmental events and real-world norms (Afriyadi,

2020; Febriyanti, 2021; Khusnunnisa & Andriani, 2025; Masrukhin et al., 2024; Munawarah et al., 2025; Pristiwanti et al., 2022; Syahrir et al., 2025; Zahro et al., 2024). Modern education prevents exploitation and broadens worldly insights, making primary schooling a critical period for children to acquire systematic knowledge as a foundation for subjects like Science and Social Studies (IPAS), Mathematics, and Indonesian Language, where elementary students develop scientific foundations across the cognitive, affective, and psychomotor domains with the ultimate cognitive goal of enhancing long-term memory to facilitate knowledge retention and transfer to new situations (Anderson et al., 2023, p. 63; Melianti et al., 2023). To achieve this cognitive mastery, students must progress from basic retention through remembering (C1) to active transfer involving understanding (C2), applying (C3), analyzing (C4), evaluating (C5), and creating (C6) within the revised Bloom's Taxonomy framework a structure within which the IPAS subject contributes significantly by providing a comprehensive understanding of life, nature, and society (Anderson et al., 2023, pp. 67–68; Lestari & Nabila, 2024).

Although students are deemed successful upon meeting competency standards, many fourth-graders at SDN Tambakaji 01 fail to reach the minimum mastery criteria in IPAS specifically on the heavy memorization topic of Hindu-Buddhist Kingdoms due to monotonous, textbook-heavy teaching that lowers motivation and causes disinterest (Hidayati et al., 2022; Sari et al., 2021). This issue is further compounded by insufficient practice, limited parental support, and a lack of instructional media to aid historical interpretation (Novianti, 2021). Interviews confirm that both teachers and students, who strongly prefer technology-based learning, urgently require an attractive, interactive medium suited to their developmental stage to simplify complex concepts and optimize memory retention (Mukarromah & Andriana, 2022; Wulandari et al., 2023).

Current literature presents a gap regarding the use of music in education. Artanto (2022) found that using children's songs alone as a learning medium had a suboptimal effect on learning outcomes. Conversely, research by An-Nisa and Sutikno (2024) demonstrated that songs packaged within animated videos are highly effective. This suggests that students require more than just audio; they need the visual stimulation provided by animation. Previous developments, such as the work by Firdaus and Mintohari (2020) on circulatory system videos, utilized existing folk song melodies like "Yamko Rambe Yamko." Similarly, Kusuma and Airlanda (2022) developed music videos for the respiratory system with original arrangements. Based on these findings, developing the VILLA (Video Lagu Anak) media for the topic of Hindu-Buddhist Kingdoms presents a significant opportunity for innovation. VILLA media serves as an audio-visual tool that engages both sight and hearing, helping students optimize their understanding of historical content.

What strictly distinguishes VILLA from previously developed educational videos lies in its holistic conceptual reconstruction, shifting from a technology-centered approach that often fails to improve education to a student-centered design that aligns with how the human mind operates (Mayer, 2001, p. 10). Rather than treating multimedia as passive information acquisition where students merely absorb

presented material, VILLA is conceptually structured as a tool for active knowledge construction (Mayer, 2001, pp. 12–13). While previous media merely coupled existing or rearranged melodies with general animations, VILLA introduces a radical innovation in its dual-coding integration. VILLA systematically incorporates five cognitive stages: selecting relevant words, selecting relevant images, organizing selected words, organizing selected images, and integrating word and image representations (Mayer, 2001, p. 54). It introduces a tailored narrative lyric structure specifically engineered to help students select and organize complex verbal information into a structured knowledge system within the auditory channel, combined with an original musical composition designed rhythmically to trigger mnemonic retention without overloading the limited working memory capacity (Mayer, 2001, pp. 55–56). Visually, the simple yet comprehensive animations are designed to engage the visual channel, allowing students to build logical connections across images (Mayer, 2001, p. 56). By coordinating both verbal and visual channels simultaneously, VILLA functions as a structured cognitive scaffolding tool that facilitates deep understanding through active cognitive processing (Mayer, 2001, p. 41).

Conceptually, this research offers a substantial theoretical contribution to elementary education by enriching the discourse on achieving meaningful learning in complex historical topics. Grounded in Mayer's theory, VILLA ensures that students do not fall into "no learning" (failure in retention and transfer) or mere "rote learning" (success in retention but failure in transfer) (Mayer, 2001, pp. 16–17). Instead, by facilitating active cognitive processing, it drives students toward meaningful learning where they successfully achieve both retention and transfer (Anderson et al., 2023, p. 71; Mayer, 2001, p. 17). It provides a concrete model of how dual-coding multimedia can transform abstract factual knowledge into structured conceptual knowledge (Anderson et al., 2023, p. 30). This framework bridges the cognitive gap from remembering (C1) and understanding (C2) up to the level of analyzing (C4), allowing students to break down historical materials into component parts and understand their relational structure (Anderson et al., 2023, p. 77). Practically, this study provides elementary school teachers with a validated, replicable framework and instructional media capable of promoting higher-order thinking skills (HOTS). It shifts the teaching paradigm of history from tedious memorization to active, student-centered analysis, equipping educators with an effective strategy to improve students' cognitive learning outcomes in a measurable way (Listiani & Rachmawati, 2022). The objective of this research is to develop, describe the feasibility, and test the effectiveness of VILLA (Video Lagu Anak) media for fourth-grade students at SDN Tambakaji 01 in the material Hindu-Buddhist Kingdoms in the Archipelago of IPAS Subject.

2. Methodology

This study employs a mixed-method Research and Development (R&D) design following the five stages of the ADDIE model at SDN Tambakaji 01 during the 2024/2025 academic year, where the Analysis stage identified that 55 fourth-grade students faced memorization difficulties in abstract Hindu-Buddhist history,

leading to the Design stage where a conceptual prototype of VILLA (Video Lagu Anak) with chronological lyrics was drafted. During the Development stage, the media was built using Walk Band, acoustic guitar, Inshot, CapCut, Adobe Illustrator, Adobe Animate, and Adobe After Effects, and was rigorously validated by three PGSD UNNES expert lecturers: a Media Expert (instructional media development), a Content Expert (Elementary Social Studies/IPS to ensure historical accuracy), and a Language Expert (Indonesian Language education). The evaluation utilized structured instruments covering 19 media indicators (effectiveness, interactivity, attractiveness, relevance, simplicity of language, simple lyrics, cheerful melody, clear sound quality, memorability, engaging animation, color combination, animation-lyric alignment, font legibility, clear credits roll, practicality, efficiency, enjoyment, engagement, and learning facilitation), 6 content indicators (alignment with learning achievements, objectives, topics, student cognition, mnemonic support, and sequential presentation), and 13 language indicators (sentence simplicity, readability, cognitive alignment, vocabulary suitability, EYD spelling compliance, grammar, vocabulary appropriateness, precise sentence use, simple sentence structure, illustrative visualization, terminology consistency, writing style consistency, and text structure consistency); based on their feedback, the product underwent structured revisions where the Media Expert required re-recording the audio from a minor to a major key to boost learning enthusiasm, and the Language Expert required restructuring subtitle layouts to align with natural sentence breaks and correct punctuation, while the Content Expert requested no revisions.

For the Implementation stage, a random sampling technique was applied to the population (N = 55), and the sample size was determined using the Slovin formula $n = \frac{N}{1+Na^2}$ with a 10% significance level (a = 0.1), which is highly justified for applied educational classroom settings with localized, small populations to accommodate natural behavioral variances and technical constraints without undermining data validity; this yielded exactly 35 students for the large-group trial, while the remaining margin was optimized by assigning 15 students for the small-group trial, which ultimately concluded in the Evaluation stage to measure the media's empirical practicality and cognitive instructional effects.

Instrument

Research instruments included expert validation (Likert scale), student response surveys (Guttman scale), and cognitive tests. Data were analyzed via SPSS 24 to ensure validity and reliability (KR-21 and Cronbach's Alpha ≥ 0.70), alongside difficulty level and discriminating power assessments.

Data Collection

Data was gathered through the ADDIE stages. Interviews for needs analysis, prototyping in design, and media production/validation in development. The implementation phase included student trials (N=15 and N=35), followed by an evaluation of effectiveness using post-tests and existing academic records.

Data Analysis

Data analysis involved an initial Shapiro-Wilk normality test ($p > 0.05$). Depending on the distribution, either a Paired Sample T-Test or a Wilcoxon Signed-Rank test was used to compare pre-test and post-test means. Media effectiveness was measured using the N-Gain score, with results exceeding 76% categorized as "effective."

3. Results and Discussion

Result

The development of VILLA media followed the ADDIE instructional design model. The results for each stage are presented as follows:

a. Analysis Stage

The analysis phase involved interviews and questionnaires with fourth-grade teachers and students at SDN Tambakaji 01. Findings indicated that students struggled with the Hindu-Buddhist Kingdom material due to its heavy reliance on memorization and the lack of interactive media. Cognitive evaluation scores for this topic were lower than other subjects. Students expressed a strong interest in technology-integrated learning, and teachers highlighted the need for media that simplifies complex historical concepts into memorable formats.

b. Design Stage

Based on the needs analysis, a prototype of the VILLA media was designed. This included drafting song lyrics that summarized key historical facts about the Hindu-Buddhist Kingdoms and creating visual storyboards for animation. The media was structured to ensure clarity in both audio (song) and visual (animation) components. The lyrics design is presented in Table 1 and the main animated video design is presented in Figure 1, Figure 2, and Figure 3.

Table 1. VILLA Lyrics Design

No	Song Lyric Section	Song Lyric Components
1	Opening Section	Contains lyrics inviting students to learn about the Hindu-Buddhist Kingdoms in the Archipelago.
2	Introduction to Hindu Kingdoms	Contains lyrics regarding the characteristics of the kingdoms, the number of kingdoms being studied, and an invitation to learn about Hindu-influenced kingdoms in the Archipelago.
3	Introduction to Buddhist Kingdoms	Contains transition lyrics from Hindu-influenced kingdoms to Buddhist-influenced kingdoms.
4	Verses for Hindu and Buddhist Kingdoms	Contains lyrics where the 1st line is the kingdom's name, the 2nd line is the center of the kingdom, and the 3rd and 4th lines are the names of famous kings.
5	Closing Section	Contains lyrics with an invitation to remember the material that has been studied.



Figure 1. Intro Section Storyboard of VILLA Media



Figure 2. Core Song Section of VILLA Media



Figure 3. Credits Section of VILLA Media

c. Development Stage

The media was produced using Adobe After Effects, Adobe Animate, and Adobe Illustrator for visuals, while audio was recorded using the Walk Band application. The final product of this media is an animated music video with a total duration of 3 minutes and 33 seconds, which includes the opening, the main song, and the closing sections. The lyrics of this media are as follows.

Ayo kawan kita mengenal kerajaan Hindu-Buddha di Nusantara
Apakah kamu penasaran?
Mari bersama kita nyanyikan

Sekarang kerajaan Hindu
Tersebar di Nusantara
Terdapat 7 kerajaan yang akan kita nyanyikan

Pertama Kerajaan Kutai
Pusatnya di Kalimantan Timur

Terdapat raja terkenalnya yaitu raja Mulawarman

Kedua Tarumanegara
Pusatnya di Jawa Barat
Rajanya tentunya terkenal yaitu raja Purnawarman

Yang ketiga Kerajaan Kalingga
Pusatnya di Jawa Tengah
Yang dipimpin seorang ratu
Ratu Shima adalah namanya

Keempat Mataram Hindu
Pusatnya di Jawa Tengah
Banyak raja terkenalnya, salah satunya Sanjaya

Yang kelima kerajaan Kediri
Pusatnya di Jawa Timur
Terdapat raja terkenalya yaitu raja Jayabaya

Keenam ada Singosari
Pusatnya di Jawa Timur
Tentunya kalian mengenal Ken Arok adalah rajanya

Yang ketujuh ada Majapahit
Pusatnya di Jawa Timur
Terdapat raja terkenalnya
Hayam Wuruk lah namanya

Kita baru saja belajar Kerajaan Hindu di Nusantara
Sekarang kita lanjutkan
Kerajaan Buddha di Nusantara

Pertama ada Sriwijaya
Pusatnya di Sumatera Selatan
Terdapat raja terkenalnya bernama Balaputera Dewa

Kedua Mataram Buddha
Pusatnya di Jawa Tengah
Yang rajanya juga terkenal yaitu Samaratungga

Itulah dua kerajaan bercorak Buddha di Nusantara
Tetaplah diingat selalu
Kerajaan Hindu-Buddha di Nusantara

There are detailed specifications of the VILLA media animated video, consisting of an introductory section containing the media title (presented in Figure 4), the main song section parts of which are presented in Figure 5 and a closing section containing the credits of various parties who contributed to the creation of this

media (presented in Figure 6). These presented results represent the final version of the VILLA media, which has been revised by the researcher based on the feedback from the expert validators.



Figure 4. Intro Section of VILLA Media



Figure 5. Core Song Section of VILLA Media



Figure 6. Credits Section of VILLA Media

The results in Figure 4, Figure 5, and Figure 6 illustrate the core sections of the VILLA Media. The complete version of the VILLA media can be accessed via the following link: https://bit.ly/MediaVILLA. Expert validation was conducted to

ensure the feasibility of the product. The VILLA media was evaluated by three experts: a media expert, a material expert, and a language expert. The media validation result is presented in Table 2.

Table 2. VILLA Media Validation Result

No	Expert Validator	Assessment Result
1	Media	88.5%
2	Material	93.3%
3	Language	96.6%
Average Total Assessment Result		95%

Table 1 indicates that Media Experts gave a score of 88.5% (Highly Feasible), Material Experts gave a score of 93.3% (Highly Feasible) and Language Expert gave a score of 96.6% (Highly Feasible). Therefore, the VILLA media obtained an overall feasibility score of 95% (Highly Feasible).

d. Implementation Stage

The media was implemented in two phases. In the small group trial (15 students), the student response score was 95%. In the large group trial (35 students). Learning in each group both the small group and the large group was conducted by first providing instruction without the media, followed by a pre-test; then, learning proceeded using the media, followed by a post-test. At the end of each learning session, students filled out the student response questionnaire. The response remained consistently high at 95%, categorized as “Very Feasible”. This suggests that the media was highly engaging and easy to use for fourth-graders.

e. Evaluation Stage

The effectiveness was measured through pre-test and post-test scores. The average pre-test score was 61.88, which increased significantly to 90.22 in the post-test. The normality test using Shapiro-Wilk showed a significance value of 0.000 (< 0.05), indicating non-normally distributed data, thus requiring the Wilcoxon Signed-Rank Test. The test resulted in a significance value of 0.000, meaning there was a significant difference in learning outcomes after using VILLA media.

Table 2. Pre-test and Post-test Comparison and N-gain Score

Metric	Pre-Test	Post-Test
Number of Students (N)	35	35
Minimum Score	40	80
Maximum Score	87	100
Mean Score	61.88	90.22
N-Gain Score		0.7441
Category		High

Based on Table 2, the calculation of the N-Gain score resulted in 0.74, which falls into the “High” category. Consequently, the VILLA media positively and effectively influences the cognitive learning achievements of the students.

Discussion

The development of VILLA media aims to improve the cognitive learning outcomes of fourth-grade students at SDN Tambakaji 01, utilizing the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation) (Rayanto & Sugianti, 2020). The Analysis phase reveals that the low learning outcomes in Science and Social Studies (IPAS) regarding the Hindu-Buddhist Kingdoms material with class averages ranging from 69 to 74, which fall below the minimum learning mastery standards of 76 are caused by the abstract and complex nature of the subject matter. This is further exacerbated by the limited availability of specialized and interactive learning media, making it difficult for students to progress through the retention process (C1) and knowledge transfer (C2-C6) (Anderson et al., 2023). Questionnaire results indicate that 55 students agree on the need for audio-visual media that incorporates technology.

In the Design phase, the researcher designed a prototype consisting of song lyrics that summarize the kingdom characteristics, royal centers, and names of famous kings. The lyrics were structured with a simple pattern to ensure they are easily remembered, consistent with the characteristics of educational children's songs (Istifadah et al., 2024). Visualization in the form of animated videos was designed as a creative foundation to facilitate knowledge transfer through visual and auditory means (Nurcahyo, 2022).

In the Development phase, the lyrics and melodies were produced using the Walk Band application, accompanied by an acoustic guitar in 4/4 time. The visualization process utilized Adobe Illustrator, Animate, and After Effects to create mouth and eye movements in the animation designed to capture students' attention (Adiati et al., 2023). Expert validation results indicated a very high level of feasibility: the Media Expert gave a score of 96% (Highly Feasible) with revisions regarding vocal cheerfulness; the Subject Matter Expert provided 92% (Highly Feasible), noting that the material was systematic and relevant; and the Language Expert awarded 98% (Highly Feasible) with minor spelling corrections in the lyrics.

During the Implementation phase, small-group (n=15) and large-group (n=35) trials showed consistent results. Student responses reached 95% (Highly Feasible), while teacher responses increased from 73% (Feasible) to 98% (Highly Feasible) following technical improvements in the learning process. This evidence proves that the VILLA media is practical, enjoyable, and effective in facilitating learning needs (Astuti, 2023).

The effectiveness of the media was measured during the Evaluation phase using pre-test and post-test data. Since the data was not normally distributed (based on the Shapiro-Wilk test), the analysis was conducted using the Wilcoxon Signed-Rank test. The results showed an Asymp. Sig. (2-tailed) value of 0.000 (< 0.05), indicating a significant difference in students' cognitive outcomes after using the media. This improvement was further reinforced by the N-Gain test, which yielded a score of 0.74 (High Category). The use of animated videos with song lyrics is proven to simplify abstract historical material into information that is easy to remember and understand (Firdaus & Mintohari, 2020). Consequently, the VILLA media is declared effective in improving students' cognitive learning outcomes in

the IPAS subject regarding Hindu-Buddhist kingdoms in the Indonesian Archipelago.

The high effectiveness of VILLA media can be explained through the cognitive mechanics of human information processing. According to Mayer's Cognitive Theory of Multimedia Learning (Çeken & Taşkın, 2022; Mayer, 2001, p. 44, 2024), human working memory possesses separate processing channels for visual and auditory streams, both of which have a strictly limited capacity. VILLA media is highly effective because its design respects these cognitive constraints. Instead of forcing students to read dense textual paragraphs about Hindu-Buddhist history which causes cognitive overload VILLA presents information through dual-coding integration. The text and animations are processed by the visual channel, while the original musical arrangements and sung lyrics are simultaneous processed by the auditory channel. This coordinated delivery reduces extraneous cognitive load, allowing working memory to efficiently allocate resources to essential processing (Mayer, 2001, p. 41).

The structural integration of music within VILLA acts as a powerful cognitive scaffolding tool for information processing that simultaneously fosters musical abilities, emotional expression, and well-rounded student development (Yao & Li, 2023). Grounded in the cognitive framework by Anderson et al. (2023, p. 74), learning relies on two primary goals: retention (remembering) and transfer (understanding and applying). The musical components of VILLA specifically designed in a cheerful major key with a steady 4/4 time signature directly facilitate the cognitive processes of encoding and retrieval. During the encoding phase, the rhythmic patterns, repetitive melodic structures, and structured rhyming lyrics serve as a mnemonic grid. This grid chunks abstract, memory-heavy historical facts (e.g., matching "King Mulawarman" with the Kutai Kingdom in East Kalimantan) into organized cognitive units. During the retrieval phase, the memorable melody acts as an internal contextual cue. When students hum or recall the melody, it triggers the cognitive reconstruction of the lyrics, allowing them to pull stored factual knowledge from long-term memory back into working memory (Mayer, 2001, p. 57).

The factor driving the significant shift in students' post-test scores is VILLA's ability to transition students from acquiring isolated factual knowledge to constructing integrated conceptual knowledge (Anderson et al., 2023, p. 30). In Mayer's framework, meaningful learning occurs when a student actively selects relevant words and images, organizes them into coherent mental models, and integrates them with prior knowledge (Mayer, 2001, p. 52). VILLA does not simply promote passive rote learning where a student retains facts but fails to transfer them (Mayer, 2001, p. 17). By synchronizing the visual timeline of the animated kingdoms with the narrative structure of the lyrics, students are guided to build a coherent relational schema of history. They move from basic remembering (C1) to understanding (C2) and analyzing (C4), allowing them to break down the broader historical structure of Hindu-Buddhist eras in the Archipelago and successfully solve higher-order thinking skills (HOTS) assessment tasks (Anderson et al., 2023, pp. 75–77).

Despite these positive statistical and theoretical indicators, it is critical to acknowledge the methodological limitations of this study. The evaluation of VILLA's effectiveness relied strictly on a one-group pretest-posttest design. Consequently, this design cannot definitively isolate internal validity threats, meaning it cannot fully guarantee that the observed cognitive improvements were solely caused by the VILLA media rather than external factors, maturation, or teacher bias. To address this limitation and establish a more robust causal empirical baseline, future research should utilize a true experimental or quasi-experimental design incorporating a distinct control group to rigorously compare VILLA's performance against conventional textbook-based instruction.

4. Conclusion

The research concludes that the VILLA media developed using the ADDIE model effectively improves the cognitive outcomes of fourth-grade students regarding Hindu-Buddhist history. Developed based on teacher and student needs, the media is highly feasible, evidenced by excellent expert validation scores and overwhelmingly positive responses from students and teachers at SDN Tambakaji 01. Furthermore, effectiveness trials using the Wilcoxon Signed-Rank test and N-gain calculations demonstrate a significant increase in learning results. Therefore, VILLA media serves as a valid and efficient instructional tool to simplify complex historical concepts while fostering better retention, student understanding, and meaningful engagement. This study contributes significantly to the field of elementary education by providing an empirically validated model of dual-coding multimedia that successfully bridges the gap between abstract factual history and conceptual student understanding, offering a practical implication for elementary school teachers as a ready to use, tech-integrated strategy to transform dense, memory-heavy social science (IPAS) topics into highly engaging, structured mnemonic learning experiences. However, a key limitation of this research is its reliance on a localized sample at a single school and a one-group pretest-posttest design, which restricts the broader generalization of its causal effectiveness, leading to the recommendation that future research should deploy quasi-experimental designs with a distinct control group across multiple schools and diverse student demographics to further establish the external validity and long-term retention impact of the VILLA media.

Acknowledgement

Please acknowledge such as your research grant, organization, scholarship (if any)

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How to cite this article:

Nurmala Sr, D., & Andaryani, E. T. (2026). Development of VILLA Media to Enhance Fourth-Graders' Cognitive Outcomes on Hindu-Buddhist Kingdoms. *Journal of Educational Sciences*, *10(8)*, 25-39.