

Development of Articulate Storyline 3 Interactive Multimedia for IPAS Learning in Elementary Schools

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ABSTRACT

This study addressed the recurring problem of monotonous, text-centered instruction in fifth-grade Science and Social Studies (IPAS) classes by developing an Articulate Storyline 3-based interactive multimedia product structured around the Discovery Learning syntax. The research followed a Research and Development (R&D) approach guided by the ADDIE framework and focused on the sub-topic of regional cultural heritage. Data were gathered through expert validation sheets, teacher and student practicality questionnaires, and a pretest-posttest instrument, then analyzed descriptively using percentage-based scoring. The product obtained a cumulative validity index of 90.14% (very valid), a combined practicality score of 93.20% (very practical), and lifted the mean cognitive score from 62.62 to 84.76, corresponding to 90.48% classical mastery (very effective). These findings indicated that the developed multimedia narrowed the gap between abstract IPAS concepts and elementary students' concrete-operational thinking, and offered a technically sound, classroom-ready alternative to conventional teacher-centered delivery.

ABSTRAK

Penelitian ini dilatarbelakangi oleh permasalahan pembelajaran IPAS kelas V yang masih monoton dan berpusat pada teks, sehingga dikembangkan multimedia interaktif berbasis Articulate Storyline 3 yang disusun mengikuti sintaks Discovery Learning. Penelitian menggunakan pendekatan Research and Development (R&D) dengan model ADDIE, berfokus pada submateri kekayaan budaya daerah. Data dikumpulkan melalui lembar validasi ahli, angket praktikalitas guru dan peserta didik, serta instrumen pretest-posttest, kemudian dianalisis secara deskriptif berbasis persentase. Produk memperoleh indeks validitas kumulatif 90,14% (sangat valid), skor praktikalitas gabungan 93,20% (sangat praktis), serta mampu menaikkan rata-rata nilai kognitif dari 62,62 menjadi 84,76 dengan ketuntasan klasikal 90,48% (sangat efektif). Temuan ini menunjukkan bahwa multimedia yang dikembangkan mampu menjembatani konsep IPAS yang abstrak dengan cara berpikir operasional konkret peserta didik sekolah dasar, sekaligus menjadi alternatif yang layak secara teknis untuk menggantikan pembelajaran konvensional yang berpusat pada guru.

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1. Introduction

The Industrial Revolution 4.0 has repositioned digital technology from a supplementary classroom aid into an infrastructural requirement for maintaining the quality of instruction, and formal education sits at the forefront of this shift.

Elementary education plays a decisive developmental role, as this stage is when children's cognitive, affective, and scientific-reasoning capacities first take structural form. Following Piaget's stage theory, most elementary-aged children (7–12 years) remain in the concrete operational stage, meaning a scientific concept is only meaningfully internalized when it is presented in a tangible, visible, and sensory-accessible form. Technology-based instructional media is therefore best understood as a cognitive bridge that converts abstract subject matter into visual-auditory representations children can process directly.

Science and Social Studies (IPAS), the integrative subject introduced for grade V under the Merdeka Curriculum [1], merges natural-science and social-science content on the premise that natural phenomena and social life cannot be meaningfully separated. Suhelayanti et al. [2] note that IPAS is intended to build scientific literacy, critical thinking, environmental awareness, and cultural identity from an early age; in practice, however, grade V IPAS content is dense with chronological, geographical, and cultural material that becomes abstract when delivered only through conventional text.

Field observation and preliminary interviews at partner elementary schools revealed a persistent gap between this curricular ideal and everyday classroom practice. Instruction still relied heavily on printed textbooks, static slide presentations, and one-directional video screenings that gave students no interactive control, reinforcing a teacher-centered pattern in which learners were positioned as passive recipients of information rather than active participants (cf. Susanti [3] on the role of instructional media in learning quality).

This condition was not caused by a shortage of hardware. Most partner schools were already equipped with LCD projectors, smart TVs, laptops, and Wi-Fi access consistent with the broader Society 5.0 push toward converging physical and digital learning spaces. The bottleneck instead lay in teachers' Technological Pedagogical Content Knowledge (TPACK): many educators still found it difficult to design, produce, or adapt interactive digital media suited to both subject matter and students' developmental characteristics, leaving the available ICT infrastructure underused as little more than a digital blackboard.

Left unaddressed, this pattern of passive, one-way instruction visibly reduced student motivation and attention, manifesting as declining concentration, disengagement from questions and discussion, and weaker IPAS learning outcomes overall. Addressing it calls for instructional media that integrates visual-auditory content with a measurable feedback mechanism

rather than one more static digital slide.

Articulate Storyline 3 was selected for this study because of its capacity to combine narrative text, graphics, audio, video, animation, quizzes, adaptive navigation, and automated feedback into a single standalone application without requiring programming expertise [4]. Its principal advantage for classroom use is that it hands control of pacing and navigation to the learner, supporting a self-regulated learning experience — a design direction consistent with earlier Storyline-based development studies in Indonesian elementary classrooms [5]–[8].

Technology alone, however, does not guarantee pedagogical value unless it is anchored to a sound learning theory. This study therefore paired Articulate Storyline 3 with the syntax of the Discovery Learning model — stimulation, problem statement, data collection, data processing, verification, and generalization [9] — a sequence considered well matched to the Merdeka Curriculum's emphasis on the Pancasila Student Profile (active, independent, critical, and creative learners). The combination of interactive media and Discovery Learning syntax has been explored in adjacent grade levels [10], but its application to grade V IPAS cultural-heritage content specifically remains limited.

This study contributes to the existing literature by integrating Discovery Learning syntax into Articulate Storyline 3-based interactive multimedia specifically designed for grade V IPAS cultural heritage learning. In addition, the developed product was evaluated comprehensively in terms of validity, practicality, and effectiveness across multiple elementary schools, thereby providing broader empirical evidence regarding its feasibility for classroom implementation.

Building on this rationale, the present study developed and tested an Articulate Storyline 3-based interactive multimedia product embedding the Discovery Learning model for grade V IPAS, focusing on the sub-topic of regional cultural heritage, and evaluated the resulting product against three quality parameters: validity, practicality, and effectiveness.

2. Method

2.1. Research Type and Design

This study used a Research and Development (R&D) design, operationalized through the ADDIE model — Analysis, Design, Development, Implementation, and Evaluation [11]. ADDIE was chosen for its systematic, cyclical structure, which subjects the product to formative evaluation at the end of every development stage before it proceeds to the next.

2.2. Research Subjects and Location

Participants were grade V students and teachers drawn from three public elementary schools in Padang, West Sumatra, selected through purposive sampling based on willingness to

participate and comparable access to classroom ICT infrastructure. Two schools — SDN 35 Parak Karakah and SDN 08 Parak Gadang — served as the initial trial zone for readability and micro-practicality testing, involving 2 teachers and 24 students. SDN 18 Kampung Durian served as the main research zone for the cognitive-effectiveness implementation test involving 1 teacher and 18 students. In total, 45 respondents (3 teachers and 42 students) took part across the two testing phases.

2.3. Development Procedure (ADDIE Cycle)

Analysis phase: diagnostic analysis covered (a) teacher and student needs regarding digital media availability, (b) the elementary operational-curriculum structure, (c) the depth and urgency of the subject-matter content, and (d) the psychological development profile of grade V students. This confirmed a genuine need for interactive media capable of bridging concrete-operational thinking.

Design phase: researchers produced a written storyboard, interface layout sketches, an educational color palette, material narrative scripts, an interactive quiz item bank, and a navigation flowchart, aligning IPAS Chapter 7 ("Daerah Kebanggaanku") Topic A ("What Is My Regional Culture Like?") with the Discovery Learning syntax.

Development phase: the storyboard was translated into a working application in Articulate Storyline 3. The resulting prototype was then submitted to expert judgment validation by three specialists — a content-knowledge validator, a language validator, and a learning-media design validator — each holding a minimum of a master's degree in a relevant field and at least five years of teaching or research experience.

Implementation phase: the validated prototype was applied directly in grade V IPAS lessons at the designated schools, under the direct supervision of classroom teachers and the research team.

Evaluation phase: overall product performance was reviewed across the validity, practicality, and effectiveness parameters, and the resulting findings were used to finalize the product before dissemination.

2.4. Data Collection and Analysis Techniques

Four research instruments were employed in this study. (1) Expert validation sheets used a five-point Likert scale (1 = very poor, 2 = poor, 3 = fair, 4 = good, and 5 = very good) and were tailored to each validator: 15 items for the content expert assessing concept accuracy, alignment with the Discovery Learning syntax, and content depth; 12 items for the language expert evaluating readability, grammatical accuracy, and communicative clarity; and 18 items for the media expert examining interface design, navigation, audio-visual quality, and typography. (2) The teacher practicality questionnaire consisted of 15 closed-ended statements evaluating ease of use, time efficiency, and classroom implementation, rated using the same five-point Likert scale. (3) The student practicality

questionnaire comprised 12 closed-ended statements assessing students' perceptions of attractiveness, clarity of instructions, ease of navigation, and overall learning experience. (4) The cognitive pretest-posttest instrument consisted of 20 multiple-choice items aligned with the learning objectives of Chapter 7 Topic A and covering cognitive levels C1–C4. **Prior to implementation, the instrument was first reviewed by the content expert to establish content validity. Subsequently, a pilot test was conducted to examine item validity, difficulty index, discrimination index, and internal consistency reliability using the Kuder-Richardson Formula 20 (KR-20), with a minimum acceptable reliability coefficient of 0.70.** Quantitative data from the validation sheets and questionnaires were analyzed by converting the empirical score for each aspect into a percentage:

$$\text{Percentage (\%)} = (\text{Total Empirical Score} / \text{Maximum Ideal Score}) \times 100\%$$

The resulting percentage was matched against a standard five-band qualitative criteria matrix (81–100% very valid/practical/effective; 61–80% valid/practical/effective; 41–60% moderately so; 21–40% low; 0–20% very low) to determine the product's validity, practicality, and effectiveness predicates. For the cognitive instrument, an individual student was classified as having reached mastery once their score met the school's Minimum Completeness Criteria (KKM = 70); a class was classified as classically effective once at least 75% of its students reached that threshold, following standard Indonesian classroom-assessment convention.

3. Results and Discussion

3.1. Product Validity

Theoretical feasibility testing examined three dimensions: scientific substance, language readability, and media aesthetics/mechanics. The recapitulation of expert validation scores is presented in Table 1.

Table 1 Recapitulation of Expert Validation Feasibility and Validity Assessment Results

No	Expert Dimension	Validation	Percentage Score	Qualification
1	Multimedia Specialist	Design	92.50%	Very Valid
2	Language & Readability Specialist		91.25%	Very Valid
3	Content Specialist	Knowledge	86.67%	Very Valid
Cumulative Validity Index Average			90.14%	Very Valid

Source: Primary Data Analysis Results (2026)

The cumulative validity index of 90.14% places the product in the very valid category, indicating that its conceptual, linguistic, and technical-aesthetic foundation was judged sufficiently

sound to proceed to open field testing.

3.2. Product Practicality

Practicality was measured in terms of operational usability, flexibility, time efficiency, and user interest across both the trial-school and main-research-school environments. Table 2 summarizes the recapitulated practicality responses.

Table 2 Recapitulation of Field Practicality and Usability Index Results

No	Testing Phase	Respondent	N	Score	Percentage	Practicality Category
1	Trial Schools (SDN 35 & SDN 08)	Teachers	2	141	94.00%	Very Practical
2		Students	24	1134	94.50%	Very Practical
3	Main Research School (SDN 18 Kp. Durian)	Teachers	1	68	90.67%	Very Practical
4		Students	18	824	91.56%	Very Practical
Total Practicality Index Accumulation			45	2167	93.20%	Very Practical / High Usability

Source: Field Data Analysis Results (2026)

Responses were consistently positive across sites: 94.00% (teachers) and 94.50% (students) in the trial schools, and 90.67% (teacher) and 91.56% (students) at the main research school, for a combined practicality index of 93.20% — very practical. This consistency across two independent school clusters suggests the product's navigation and interface were readily usable by both age groups without extensive prior training.

3.3. Product Effectiveness

Effectiveness was assessed from the gain between pretest and posttest cognitive scores. Table 3 presents this data across the three participating schools.

Table 3 Analysis of Cognitive Learning Outcome Improvement Effectiveness Significance

No	School	N	Pre-test Avg	Post-test Avg	Classical Mastery	Effectiveness Criteria
1	SDN 35 Parak Karakah	9	65.56	86.67	88.89%	Very Effective
2	SDN 08 Parak Gadang	15	62.00	82.00	86.67%	Very Effective
3	SDN 18	18	61.67	86.11	94.44%	Very

Kampung Durian					Effective
Combined Macro Classical Average	62.62	84.76	90.48%	Very Effective	

Source: Evaluation Data Analysis Results (2026)

Cognitive mastery increased consistently at every school: from 65.56 to 86.67 at SDN 35 Parak Karakah (88.89% classical mastery), from 62.00 to 82.00 at SDN 08 Parak Gadang (86.67%), and from 61.67 to 86.11 at SDN 18 Kampung Durian, which recorded the highest classical mastery rate at 94.44%. **The combined average rose from 62.62 to 84.76 — a gain of 22.14 points — with 38 of 42 students reaching the KKM threshold, for an aggregate classical effectiveness of 90.48% (very effective).**

3.4. Discussion

Taken together, these three parameters indicate that pairing Articulate Storyline 3-based interactive media with Discovery Learning syntax can produce measurable gains in both classroom usability and cognitive outcomes, consistent with earlier Storyline-based development work in Indonesian elementary settings [5]–[8], [12]–[13].

The high content-validity score (86.67%) suggests the visualization of regional cultural material was structurally coherent and free of conceptual distortion: IPAS Chapter 7 content was rendered through graphics and audio-video material representing cultural realities familiar to students, which helped bridge the abstraction gap Piaget's framework predicts for this age group. The media-design score (92.50%) reflects Articulate Storyline 3's technical strength in producing responsive navigation, comfortable color schemes, and readable typography, while automated feedback on practice items appears to have reinforced student confidence and curiosity — a pattern also reported by Reinita et al. [8] in their Storyline-CTL training study. The language-validity score (91.25%) indicates that narrative text was written at a level consistent with the psycholinguistic profile of concrete-operational learners.

The practicality results point to a shift in classroom roles rather than only a usability gain: teachers reported that the media reduced the time spent on repetitive explanation of abstract or memorization-heavy content, allowing them to act more as facilitators than as the sole source of information — an outcome broadly aligned with Susanti's [3] account of media's role in learning quality. For students, the interactive format appeared to accommodate a range of learning-style preferences: visual learners through infographics and animation, auditory learners through narration, and kinesthetic learners through tap and drag-and-drop interaction, which may partly explain the sustained engagement observed across both trial and main-research sites.

The effectiveness data are consistent with the Discovery Learning sequence embedded in the product: the Stimulation stage used contrasting video material on regional cultural diversity to capture initial attention; the Problem Statement stage

prompted students to formulate hypotheses about cultural phenomena; the Data Collection and Data Processing stages had students navigate infographics and audio explanations to build answers; the Verification stage used branching quiz items to test those hypotheses; and the Generalization stage guided students toward a summary conclusion. This progression is intended to have students construct understanding through guided discovery rather than rote memorization, which is consistent with the conceptual case made by Marisya and Sukma [9] for Discovery Learning in elementary thematic instruction, and may account for the size of the pre-to-post gain observed here relative to the more incremental effectiveness figures reported in related Storyline-based studies without an explicit Discovery Learning structure [12], [14].

The systematic, stage-gated structure of the ADDIE cycle [11] also appears to have contributed to the product's overall feasibility: because each phase (Analysis, Design, Development, Implementation, Evaluation) was formatively reviewed before the next began, deficiencies in content, language, or interface could be corrected earlier in the process rather than after full deployment, which is consistent with the quality-control rationale generally offered for ADDIE-based instructional design.

3.5. Limitations

Several limitations should be considered when interpreting these findings. First, the study used a one-group pretest-posttest design without a comparison or control class, so the observed cognitive gain cannot be fully isolated from maturation, testing, or other concurrent classroom effects. Second, the sample was restricted to 42 students and 3 teachers across three public elementary schools within a single city (Padang), which limits the generalizability of the validity, practicality, and effectiveness figures to other regions or school contexts. Third, the product and its evaluation covered only one sub-topic (Topic A of IPAS Chapter 7), so claims about effectiveness should not be extended to the full breadth of the grade V IPAS curriculum without further testing. Fourth, evaluation was limited to a single implementation cycle immediately following the intervention; the durability of the cognitive gains over time (retention) was not assessed. Finally, because Articulate Storyline 3 output assumes a minimum level of device and internet infrastructure, the practicality findings may not transfer directly to schools with more limited ICT access.

4. Conclusion

This developmental research, carried out through the ADDIE cycle, produced an Articulate Storyline 3-based interactive multimedia product integrating the Discovery Learning model for grade V elementary IPAS. Across the three quality parameters examined, the product achieved a very valid

predicate (86.67% content, 91.25% language, 92.50% media design; cumulative index 90.14%), a very practical predicate (90.67% teacher and 91.56% student response; combined index 93.20%), and a very effective predicate (mean score rising from 61.67 to 86.11 with 94.44% classical mastery at the main research school, and an aggregate classical effectiveness of 90.48%). These results indicate that the product is theoretically and practically ready to serve as an innovative learning medium capable of improving both the process and outcomes of elementary IPAS instruction, within the limitations noted in Section 3.5.

Recommendations

For classroom teachers: this interactive multimedia can be adopted as a periodic alternative to conventional delivery to reduce learning boredom and support a more student-centered classroom.

For school principals: facilitating teacher training in producing Articulate Storyline-based media (e.g., through workshops) would help schools make fuller use of ICT infrastructure already in place.

For future R&D researchers: extending this line of work to other IPAS chapters with higher abstraction levels, using a larger and more geographically diverse sample, and incorporating a control-group or retention-testing design would help establish the stability of these effects across contexts.

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