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Bridging pedagogy and technology: Developing contextual digital story media to support foundational literacy

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Abstract: The low interest and early reading skills of elementary school students in Indonesia necessitate the implementation of contextual and engaging learning innovations. This study aims to develop curriculum-aligned interactive digital storytelling media to support basic literacy. The methodology employed was a mixed-method exploratory approach, involving a quantitative survey of 238 students and 26 teachers, in-depth interviews, and analysis of curriculum documents (CP, TP, ATP). The results indicated that students exhibited a high interest in digital media featuring images (M=4.23), interactivity (M=3.95), and audio components (M=3.76), while their preference for print media was moderate (M=2.84). Teachers expressed a strong need for media that is engaging (M=4.31), aligned with the curriculum (M=4.27), and time-efficient (M=4.42). The most desired media features included interactive storytelling (M=4.30) and audio-text synchronization (M=4.17). Key challenges identified were limited time, infrastructure constraints, and insufficient digital training. Based on these findings, a BUCERI prototype was designed, incorporating interactive storytelling features, audio narration, and story creation tools. This media is tailored to curriculum competencies, adaptable to student levels, and encourages creative expression. In conclusion, BUCERI bridges the gap between pedagogy and technology, with significant implications for enhancing basic digital literacy in elementary schools.

Keywords: *Assessment, Basic literacy, BUCERI, Contextual learning, Interactive media, National curriculum.*

1. Introduction

The development of early reading skills is vital for establishing a robust foundation for literacy and academic success in students. Empirical studies underscore that early literacy skills, such as phonological awareness, letter knowledge, and vocabulary comprehension, significantly predict later reading and writing proficiency [1, 2]. For instance, Majorano, et al. [2] found a direct correlation between early literacy skills measured at preschool and subsequent reading outcomes, indicating that skills such as phonological awareness and letter knowledge are crucial for later success in reading and writing [2]. This early stage of literacy learning is critical as children experience rapid cognitive and linguistic development, which can be effectively harnessed through diverse educational strategies [3]. Stimulatory practices like shared book reading have been shown to enhance children's comprehension and interest in reading, thereby contributing to their overall literacy development, although some studies suggest there may be variability in how effectively this is implemented across different contexts [4, 5].

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New digital technologies, especially interactive story-based media, have increased student reading engagement. Digital storytelling and e-books can inspire young children to read and improve their literacy skills [6]. Digital resources allow educators to create immersive learning environments that suit students' learning styles, making reading more fun [7]. Interactive media can improve education by engaging children and promoting literacy by addressing reading disengagement. Early literacy development and digital technology can help kids read. Research shows that early evidence-based reading interventions improve children's academic performance [2, 8]. Digital and interactive storytelling can inspire students to read and improve their narrative structures and vocabulary [7, 9]. Thus, careful integration of these methods builds foundational skills and prepares students for digital academic success.

Recent research highlights challenges and solutions in elementary school reading education. Low reading interest and skills remain significant issues [10]. Digital technologies offer promising approaches, including blended learning [11] socio-cultural digital modules [10] and digital literacy interventions [12]. However, there's a gap between research and classroom practice in using digital texts [13]. Teachers often lack training and resources for effective digital text implementation [14]. Post-pandemic, digital literacy faces challenges but remains crucial [14]. Research on reading fluency technology is limited in scope [15]. Overall, integrating digital technology with traditional methods and providing adequate teacher support are key to improving elementary reading education. While numerous digital literacy resources have emerged, many have not undergone sufficient development processes that involve direct input from educators. Instead, existing scholarship often emphasizes the efficacy of pre-packaged media, overlooking the critical needs-based framework necessary for effective pedagogical application [16]. This disconnect leads to a situation where the digital tools available in classrooms may not align with the actual instructional strategies or learning objectives defined by the national curriculum, such as the Curricular Plan (CP), Teaching Plan (TP), and Annual Teaching Plan (ATP) [17]. Consequently, educators are left with resources that may not enhance the learning experience or support the development of essential early reading competencies, which are imperative for academic success.

Moreover, there exists a remarkable scarcity of interactive children's story media platforms that cater specifically to fostering creative expression while enhancing early reading skills. As highlighted by Cahyati, et al. [18] effective integration of digital tools within classroom curricula remains a rare phenomenon [18]. This lack of direct alignment with curricular goals limits the potential for interactive media to play a transformative role in early literacy development. Research indicates that personalized media designed collaboratively with educators can more effectively engage students and ensure that content is relevant to their learning experience [19]. This gap emphasizes the need for a paradigm shift in how educational technology is conceptualized and developed, advocating for participatory development processes that prioritize the unique contexts of elementary education settings [20] thereby yielding digital tools that truly enrich the learning landscape for young readers.

Recent research emphasizes the need for contextual, engaging, technology-based learning media for primary school digital-native learners. PISA and AKSI results show that Indonesia still struggles with foundational literacy. These issues have been addressed by studies on technology-integrated instruction, including virtual laboratories, gamified learning, and augmented reality [21]. ICT-assisted media and interactive tools improve primary school student engagement and learning [22]. Context-aware ubiquitous learning models and audio-visual storytelling tools may boost motivation and higher-order thinking [23]. These findings show that educationally effective and enjoyable media can transform early literacy gaps, especially when implemented at the elementary level for long-term impact. Despite their growing availability, many digital literacy platforms don't meet elementary school students' and teachers' needs. Most digital media tools are pre-packaged without educator input, so design and classroom use differ [16]. Tools that support early reading competencies that don't align with national curriculum frameworks like the CP, TP, and ATP are less effective [17]. Few digital platforms offer student reading and creative outlets. Content engagement is limited by the lack of text, illustration, and

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audio narrative features [18, 20]. These issues require an innovative interactive media solution that integrates curriculum, user needs, and creativity. Co-designing with teachers ensures contextual relevance and curricular integration, making this work unique. BUCERI hosts student-generated text, visual, and audio stories and interactive reading experiences. This research anchors media design in curriculum structure and classroom realities, giving teachers practical options for improving foundational reading instruction through meaningful, engaging, and student-centered media.

In response to the identified gaps in early literacy instruction and the limited availability of curriculum-aligned digital media, this study aims to contribute both conceptually and practically to the development of interactive learning resources in primary education. Specifically, the research seeks to: (1) identify the needs of students and teachers regarding digital story-based learning media; (2) analyze relevant instructional content through an in-depth review of the national curriculum documents (3) design an initial prototype of an interactive digital storybook application (BUCERI), grounded in the findings from the needs assessment and curriculum analysis. Through these objectives, the study is expected to inform the design of contextual, engaging, and pedagogically sound literacy tools for young learners.

2. Literature Review

2.1. Early Reading Skills in Primary Education

Early reading skills are fundamental components of a child's educational development, profoundly influencing their long-term academic achievement. The essential elements comprise letter recognition, syllable segmentation, fluent reading, and comprehension of meaning. Letter recognition constitutes the foundation of reading, allowing children to discern and employ letters in various contexts. Syllable segmentation aids in decoding, as evidenced by research demonstrating the relationship between phonological awareness and reading proficiency in early education [24, 25]. Fluent reading, marked by rapidity and precision, enhances comprehension and retention of the text [21, 26]. Comprehension is essential as it integrates previously acquired skills, enabling students to extract and reflect on information within narratives [8, 27]. The interaction among these components fosters a comprehensive reading proficiency vital for academic success.

The acquisition of reading skills in elementary school-aged children is frequently impeded by prevalent challenges, including deficient phonological awareness, limited exposure to diverse texts, and diminished motivation to read. Studies demonstrate that both intrinsic and extrinsic motivations substantially influence reading performance [21, 28]. Consistent exposure to engaging narratives can foster a reading habit, thereby enhancing student engagement [24, 25]. However, the absence of engaging texts and well-organized literacy programs may lead to challenges, especially in comprehension and narrative skills, which are crucial for proficient reading [29, 30].

Literacy challenges in Indonesia are particularly pronounced, as highlighted by national education assessments such as PISA and AKSI. These studies reveal alarming trends in reading comprehension skills, showing that Indonesian students often perform below average compared to their peers in other countries [30]. Notably, the School Literacy Movement introduced by the Ministry of Education aims to address these challenges by promoting a reading culture in schools. However, limited resources and a lack of trained educators hinder its effectiveness [26]. To foster a stronger reading culture, initiatives must incorporate interactive and engaging narratives that appeal to student interests while developing essential reading skills [31, 32].

2.2. Digital Story-Based Media for Literacy Learning

The potential of digital story-based media, such as interactive storytelling applications and digital storybooks, to enhance literacy learning experiences has been widely acknowledged. These tools utilize multimedia components, including text, visuals, and audio, to stimulate multiple senses, thereby facilitating memory retention and comprehension [3, 33]. By facilitating user participation through narrative choices, interactive storytelling apps further enhance learner agency and investment in the

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reading process [34]. This interactivity transforms conventional reading into a cognitively engaging, immersive experience that enhances both motivation and comprehension. Furthermore, digital storytelling has the potential to enhance collaborative learning and creative expression [35]. Additionally, research has demonstrated its capacity to promote digital literacy [36] vocabulary acquisition, and cultural learning [37]. However, the efficacy of such media is contingent upon factors such as adult mediation, learner age, and story-congruent enhancements.

In spite of these advantages, the educational potential of digital story-based media is restricted by a number of constraints. The use of numerous platforms as structured instructional tools is restricted by their failure to align with curriculum objectives [38, 39]. In general, digital stories are less beneficial for diverse learning profiles due to their lack of user-centered design and adaptive features [35]. Passive consumption by students and restricted opportunities to participate in meaningful narrative production or co-create content are also concerns [40]. Although some studies demonstrate inconsistent outcomes, particularly when contrasting digital and printed texts [41] they have yielded promising results in vocabulary and comprehension [42]. In order to optimize the educational value of digital storytelling, it is necessary to prioritize curriculum integration, learner engagement, and creative interactivity [43]. Additionally, additional research is necessary to investigate the impact of media features and learner characteristics on outcomes [44, 45]. The necessity of digital story-based media that transcends entertainment and addresses educational requirements is underscored by these constraints. The full educational potential of digital storytelling, particularly in the early stages of literacy development, will remain untapped in the absence of curricular integration, user-centered design, and creativity facilitation.

2.3. Instructional Models for Teaching Early Reading

Instructional models develop early reading skills through structured literacy instruction. One of the most popular ways to help students decipher unfamiliar words and improve reading fluency is phonics [46]. This model consistently performs well with systematic phonemic awareness methods [47]. Immersing students in authentic texts and contextual reading promotes comprehension and meaning-making over phonetic drills [48, 49]. For early readers, hybrid phonics-whole language models are recommended due to their adaptability to diverse learning needs and cognitive profiles [50]. Constructivist and multimodal models are popular for their student-centeredness. Exploration, reflection, and social interaction foster intrinsic motivation and deeper comprehension in constructivist reading instruction [32, 51]. Multimodal approaches use images, animations, and interactive text to enhance reading and address different learning modalities [52]. Both approaches have drawbacks, such as teacher unpreparedness and poor curriculum alignment [53, 54]. Therefore, sustained evaluation and strategic adaptation are needed to ensure these models support engagement, curricular relevance, and learning outcomes.

As a cognitively grounded alternative, the PASS model emphasizes neuropsychological processes that underlie academic achievement. Attention and Successive processing affect reading significantly, while Planning and Simultaneous processing affect math performance [55, 56]. PASS-based intervention programs like the Planning Facilitation Program have shown significant improvements in reading comprehension, even for gifted and twice-exceptional learners [57, 58]. The structured cognitive framework of the PASS model makes it suitable for interactive digital reading platforms. Guided prompts, audio-synchronized text, and story-based prediction tasks can reinforce PASS components like Attention, Successive processing, and Planning to enable personalized, cognitively informed literacy instruction in early education.

3. Method

3.1. Research Design

This study employs an exploratory mixed-method design, beginning with quantitative data collection through questionnaires to map user needs regarding early reading media [59]. The findings

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are then deepened through qualitative interviews to contextualize and clarify the initial patterns. This sequential exploratory process not only strengthens the validity of the findings but also ensures that the initial design of the interactive digital storybook application (BUCERI) is directly informed by empirical field data.

3.2. Participants and Setting

The participants in this study consisted of 26 early grade teachers and 238 students from grades I to III in several primary schools located in Daerah Istimewa Yogyakarta (D.I. Yogyakarta). The teachers selected were those actively involved in teaching early reading skills, while the student participants represented lower-grade learners, as for participants were selected using a random sampling technique to ensure representativeness and reduce selection bias in capturing diverse classroom contexts and literacy needs [60].

3.3. Data Collection Procedures

Data were collected in three sequential phases to ensure a comprehensive understanding of the needs and context for early literacy media development [61]. Phase 1 involved a quantitative survey distributed directly to teachers and students using a combination of closed-ended Likert-scale items (4–5 points) and open-ended questions. The instrument focused on learning experiences, reading interest, and media preferences, aiming to statistically map general user needs. In Phase 2, structured interviews were conducted with selected teachers using a guide derived from the survey results. This qualitative phase served to deepen the interpretation of the quantitative data and gather practical suggestions for media design. Lastly, Phase 3 employed document analysis of the *Capaian Pembelajaran* (CP), *Tujuan Pembelajaran* (TP), and *Alur Tujuan Pembelajaran* (ATP), with the goal of identifying core competencies and literacy content suitable for the development of a curriculum-aligned story-based media application.

Table 1.
Grid of Questionnaire and Interview Instruments.

No.	Aspects	Indicators	Theory / Reference Source
1	Reading Learning Experience	Frequency and type of reading activities in class	Ergül, et al. [1] and Inoue, et al. [4]
2	Reading Interest	Interest in reading activities at school and at home	Silinskas, et al. [5] and Nasrullah, et al. [7]
3	Learning Media Preferences	Preferred media types (print, digital, interactive)	López-Escribano, et al. [6] and Müller-Brauers [62]
4	Teacher Needs in Teaching	Constraints and needs when teaching early reading	Tortorelli and Strong [13] and Wijayanti, et al. [14]
5	Curriculum Support	Suitability of teaching materials to CP, TP, ATP	Schulenkorf, et al. [17] and Suwarto, et al. [19]
6	Proposed Interactive Media Features	Recommended media features/functions that support literacy learning	Cahyati, et al. [18] and Vidal-Hall, et al. [63]

The instrument underwent validation through item-total correlation and reliability analysis using Cronbach's Alpha [64]. All items across five aspects yielded corrected item-total correlation values ranging from 0.392 to 0.731, exceeding the critical value of r (≈ 0.361), indicating that all items are valid. Reliability coefficients for each aspect ranged from 0.732 to 0.816, exceeding the minimum acceptable threshold of 0.70, confirming that the instrument is reliable [65]. These results affirm that the questionnaire is suitable for use in the broader data collection phase of this study.

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Table 2.
Item Validity Test Results (Corrected Item-Total Correlation).

No.	Aspects	Number of Grains	Range of r Values (Corrected)	Description
1	Reading Learning Experience	4	0.421 – 0.667	Valid
2	Reading Interest	5	0.476 – 0.731	Valid
3	Learning Media Preferences	4	0.392 – 0.615	Valid
4	Teacher Needs in Teaching Reading	5	0.437 – 0.698	Valid
5	Proposed Media Features	3	0.418 – 0.672	Valid

Note: Criteria: r table (N = 30, $\alpha = 0.05$) ≈ 0.361.

Table 3.
Reliability Test Results (Cronbach's Alpha).

Aspects	Number of Grains	Cronbach's Alpha	Description
Reading Learning Experience	4	0.781	Reliable
Reading Interest	5	0.804	Reliable
Learning Media Preferences	4	0.767	Reliable
Teacher Needs in Teaching Reading	5	0.816	Reliable
Proposed Media Features	3	0.732	Reliable

Note: Criteria: $\alpha > 0.70 \rightarrow$ Reliable category

3.4. Data Analysis Techniques

The data were analyzed using a combination of quantitative and qualitative techniques in alignment with the study's mixed-method exploratory design [65]. Questionnaire responses were analyzed descriptively by calculating the mean and standard deviation to identify general patterns and variations in respondents' perceptions regarding the need for story-based digital learning media [65]. Where relevant, independent sample t-tests were conducted to compare perceptions between different respondent groups, such as teachers and students. For the qualitative phase, interview data were subjected to descriptive thematic analysis using NVivo software, involving a systematic process of open coding, categorization, and theme development to capture key insights from participants [66]. Additionally, curriculum documents (CP, TP, ATP) were examined through content analysis to identify relevant competencies, literacy themes, and instructional indicators that inform the design and curricular alignment of the proposed digital storybook application.

4. Results

4.1. Student Reading Experience and Reading Interest and Media Preference

The analysis indicates that students exhibit a commendable reading frequency at home, averaging 3.42 times per week, whereas the reading frequency at school is notably lower, recorded at 2.76 times per day. The mean reading duration per session was 18.65 minutes, reflecting inter-individual variability in reading practices. Student engagement in storytelling activities was moderate (M = 3.18), suggesting potential for enhancement through a more captivating and interactive learning methodology, as illustrated in table 4.

Table 4.
Frequency of Students' Reading Activities at Home and School.

Reading Activity Aspects	N	Mean	SD	Min.	Max.
Frequency of reading at home (per week)	238	3.42	1.28	1.00	5.00
Frequency of reading at school (per day)	238	2.76	0.94	1.00	4.00
Duration of reading per session (minutes)	238	18.65	7.23	5.00	45.00
Involvement in storytelling activities	238	3.18	1.15	1.00	5.00

Students exhibited a significant interest in reading activities, achieving an average score of 3.67 (SD = 1.02), and demonstrated an exceptionally high interest in illustrated stories (M = 4.23; SD = 0.89), suggesting that visual materials substantially enhance their reading engagement. The preference for

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interactive digital media was notably high (M = 3.95; SD = 1.07), whereas the preference for traditional print media was comparatively moderate (M = 2.84; SD = 1.21), signifying a transition in student interest towards contemporary and dynamic media. Moreover, the interest in incorporating audio elements in learning was notably high (M = 3.76; SD = 1.13), underscoring the necessity for the integration of auditory features in the creation of story-based media. The findings suggest that interactive, visual, and auditory digital literacy media possess significant potential to enhance student motivation and engagement in reading education. The analysis results are summarized in Table 5.

Table 5.
Reading Interest Scores and Learning Media Preferences.

Indicators	N	Mean	SD	Category
Interest in reading activities	238	3.67	1.02	High
Interest in picture stories	238	4.23	0.89	Very High
Preference for interactive digital media	238	3.95	1.07	High
Preference for traditional print media	238	2.84	1.21	Moderate
Interest in using audio in learning	238	3.76	1.13	High

4.2. Teacher Needs in Teaching Early Reading and Preferred Features for Digital Literacy Media

An examination of educators' requirements in early reading instruction revealed that the primary obstacle encountered was insufficient time for the preparation of instructional materials, evidenced by the highest mean score (M = 4.42; SD = 0.64). Moreover, educators required media that were captivating (M = 4.31; SD = 0.68) and congruent with curricula such as CP, TP, and ATP (M = 4.27; SD = 0.72). Concerns regarding technology integration surfaced as a significant necessity (M = 4.15; SD = 0.78), reflecting an increasing recognition of the importance of adapting to digital-based learning. Concurrently, educators underscored the significance of media that facilitate learning differentiation (M = 4.08; SD = 0.80) and are user-friendly (M = 3.89; SD = 0.91). A further challenge that garnered attention was the difficulty in assessing individual student progress, albeit with a comparatively lower score (M = 3.73; SD = 1.04). These findings highlight the necessity of creating narrative-driven digital media that are engaging, integrated with the curriculum, time-efficient, and capable of addressing varied classroom requirements, as outlined in Table 6.

Table 6.
Teachers' Needs and Challenges in Teaching Beginning Reading.

Needs/Challenges Indicators	N	Mean	SD	Priority
Availability of engaging learning media	26	4.31	0.68	Very High
Integration of technology in learning	26	4.15	0.78	High
Suitability of media to the curriculum (CP/TP/ATP)	26	4.27	0.72	Very High
Ease of use of digital media	26	3.89	0.91	High
Support for learning differentiation	26	4.08	0.80	High
Limited time for media preparation	26	4.42	0.64	Very High
Difficulty measuring individual student progress	26	3.73	1.04	High

Analysis of preferences for digital literacy media features revealed a strong consensus among teachers and students on the key features considered most important in the development of the BUCERI application. As shown in Table X, the interactive story feature with narrative options received the highest mean score (M = 4.30; SD = 0.81), ranked first by both teachers and students, confirming the importance of interactivity in enhancing the reading experience. The audio narration feature with text synchronization was also rated very important (M = 4.17; SD = 0.88), reflecting the need for multimodal support to strengthen reading comprehension.

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Table 7.
Ranking of Desired Features for Digital Literacy Media.

Digital Media Features	Teacher (n=26)	Students (n=238)	Combined	Ranking
	M (SD)	M (SD)	M (SD)	
Interactive stories with narrative options	4.19 (0.75)	4.32 (0.82)	4.30 (0.81)	1
Audio narration with synchronized text	4.12 (0.81)	4.18 (0.89)	4.17 (0.88)	2
Create your own story feature	3.96 (0.87)	4.25 (0.78)	4.20 (0.80)	3
Engaging animations and visualizations	4.08 (0.74)	4.15 (0.85)	4.14 (0.83)	4
Compliance with CP/TP/ATP	4.46 (0.58)	3.67 (1.12)	3.78 (1.09)	5
Automatic progress assessment	4.31 (0.68)	3.42 (1.15)	3.56 (1.12)	6
Gamification and reward system	3.73 (0.92)	4.08 (0.94)	4.02 (0.94)	7
Collaboration between students	3.65 (0.98)	3.89 (1.03)	3.85 (1.02)	8

The ability to create one's own story revealed a notable disparity in preference, with students achieving a higher mean score (M = 4.25) compared to teachers (M = 3.96), indicating students' inclination to engage actively in the literacy process rather than merely receiving information passively. In contrast, educators prioritized aspects associated with curriculum alignment (M = 4.46) and automated assessment (M = 4.31), while students rated these features lower (M = 3.67 and 3.42, respectively). This disparity underscores the necessity for a design strategy that reconciles educators' pedagogical requirements with learners' engagement inclinations. These findings establish a foundational framework for the creation of digital literacy tools such as BUCERI, highlighting three essential components: narrative interactivity, avenues for creative expression, and robust curriculum integration, to guarantee optimal acceptance and utilization by primary users—teachers and students.

4.3. Pedagogical Challenges in Early Literacy and Teacher Perspectives on Media Design

Interviews with twelve selected educators uncovered diverse pedagogical challenges encountered in early literacy instruction. Thematic analysis identified two primary themes: insufficient contextual media and restricted learning resources. Concerning contextual media, educators recognized a disparity between accessible educational resources and the actual experiences of students' everyday lives. One informant stated, "The existing media frequently fails to represent local culture or the lived experiences of our children in Yogyakarta." They struggle to engage with narratives that are overly general or irrelevant. This discovery corresponds with literature highlighting the significance of contextualization in early literacy acquisition.

The constraint of resources was a recurring theme throughout the interviews. Educators indicated difficulties in obtaining sufficient technology, constrained preparation time, and insufficient training in the incorporation of digital media into education. A second-grade educator stated, "We recognize the significance of technology; however, the school's infrastructure does not adequately support it." Additionally, we require media that is user-friendly and does not necessitate intricate technical setup. This scenario presents a paradox in which educators acknowledge the promise of technology yet are constrained by inadequate institutional and personal resources. The analysis results are encapsulated in Table 8 below.

Table 8.
Thematic Analysis of Pedagogical Challenges.

Key Themes	Sub-themes	Coding Frequency	Percentage
Lack of Contextual Media	Local cultural relevance	28	22.4%
	Suitability to student experiences	21	16.8%
	Limited story variety	19	15.2%
Key Themes	Technological infrastructure	24	19.2%
	Limited preparation time	18	14.4%
	Lack of digital training	15	12.0%
Total		125	100%

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Teachers' media design expectations for BUCERI were student engagement, curriculum support, and creativity development. Teachers stressed the importance of interactive elements to keep students engaged and motivated. They expected BUCERI to offer visual, audio, and digital tactile experiences. Third-grader teacher: "Kids today need variety. They get bored with static text and images. Something must engage them in the story." Curriculum support shows teachers' need for media that supports Learning Outcomes (CP), Objectives (TP), and Paths (ATP). Teachers wanted BUCERI to bridge the gap between formal curriculum and engaging learning. They wanted features to track student progress against achievement indicators. Through the story creation feature, teachers liked BUCERI's ability to foster student creativity. They balanced guided learning and creative freedom to allow students to develop personal narratives while following a structured learning structure, as shown in Table 9.

Table 9.
Categorization of Teachers' Expectations regarding BUCERI Features.

Category	Subcategories	Number of References	Density	Expected Key Features
Student Engagement (41.2%)	Interactivity	18	0.31	Narration options, responsive animation
	Multisensory	14	0.24	Synchronous audio, visual effects
	Gamification	12	0.21	Reward system, progress tracking
Curriculum Support (35.6%)	CP/TP/ATP Alignment	16	0.28	Explicit competency mapping
	Integrated Assessment	11	0.19	Auto-scoring, progress reports
	Differentiated Learning	9	0.16	Adaptive levels, multiple pathways
Creativity (23.2%)	Story Creation Tools	13	0.23	Text editor, images, audio recording
	Collaborative Features	8	0.14	Sharing stories, peer feedback
	Personalization	7	0.12	Avatars, personal themes
Total		108	1.88	

4.4. Curriculum Content Mapping dan Literacy Themes and Text Types

Core competencies that serve as the foundation for the development of BUCERI were identified through an in-depth analysis of the curriculum documents on Learning Objectives (TP), Learning Outcomes (CP), and Learning Objective Pathways (ATP) for grades I-III. Systematic mapping demonstrated that early literacy is comprised of four primary domains: basic text production, simple reading comprehension, letter and word recognition, and phonemic skills. The curriculum prioritizes the acquisition of syllable segmentation, the identification of sound patterns in simple words, and the mastery of letter sounds within the phonemic skills domain. The automation of visual recognition and decoding skills that facilitate reading fluency is the primary objective of the letter and word recognition domain.

The capacity to identify explicit information, connect images with text, and comprehend the sequence of events in brief narratives is a component of simple reading comprehension. On the other hand, basic text production underscores students' capacity to articulate ideas through a combination of writing and images, recount personal experiences, and construct simple sentences. The curriculum's preference for narratives that incorporate character values, local wisdom, and students' everyday life experiences was revealed through a more thorough examination of the recommended story themes. Short stories, descriptive texts that are specifically designed for the cognitive developmental level of early grade students, children's poems, and simple fairy tales are all recommended text types. As enumerated in table 10.

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Table 10.
Literacy Competency Mapping Based on Curriculum Analysis.

Class	Competency Domains	Key Indicators	Relevant Story Themes	Text Types
I	Phonemic Skills	- Recognizing letter sounds - Syllable segmentation	Family, Animals, Environment	Illegible stories, Children's songs
	Letter Recognition	- Letter identification - Basic letter writing	Daily Activities, Traditional Games	Simple texts with pictures
II	Reading Comprehension	- Explicit information - Picture-text relationships	Friendship, Mutual Cooperation, Nature	Short fairy tales, Fables
	Basic Text Production	- Constructing sentences - Simple storytelling	Personal Experiences, Aspirations	Simple journals, Personal stories
III	Reading Fluency	- Reading fluency - Correct intonation	Heroes, Local Culture, Simple Science	Short biographies, Informative texts
	Creative Writing	- Structured narratives - Object descriptions	Adventure, Simple Mysteries, Fantasy	Short stories, Children's poems

A comprehensive alignment framework for the initial BUCERI prototype design was created by combining student and teacher needs findings with curriculum analysis. Data convergence showed that student preferences for interactive and visual media match the curriculum's multi-sensory approach. Teachers needed curriculum-aligned media, and the CP, TP, and ATP's clear competency structure allowed for engaging and pedagogically sound media. According to the instructional alignment mapping, the BUCERI design has three main components: adaptive learning pathways that adapt to student competency levels, integrated assessments that provide real-time feedback based on curriculum indicators, and creative expression tools that help students create content while staying on track. This framework guided prototype development to ensure that each BUCERI feature engaged students and supported national curriculum literacy competencies. Divergence was observed in the assessment aspect, as teachers expressed a strong desire for automated tracking (M = 4.31), while students demonstrated moderate interest (M = 3.42). BUCERI has an innovative opportunity to develop functional and engaging assessment features through a gamification approach, as indicated by this gap.

5. Discussion

The study demonstrated students' pronounced inclination towards visual and interactive learning modalities, evidenced by elevated scores in picture stories (M = 4.23) and interactive digital media (M = 3.95). The results corroborate earlier research indicating that interactive e-books enhance learning motivation, critical thinking abilities, and reading comprehension via gamification features and contextual learning techniques [37, 67]. Indeed, interactive features not directly linked to the narrative can enhance students' learning experiences rather than serve as distractions [68]. Moreover, multimedia resources like e-books have demonstrated efficacy in facilitating thematic learning, including environmental education. However, enhancing design and pedagogical effectiveness in elementary education contexts necessitates additional investigation [26, 69].

Conversely, educators indicated a significant demand for media that is engaging (M = 4.31), time-efficient (M = 4.42), and consistent with national curricula such as CP, TP, and ATP (M = 4.27). This necessity highlights the complex challenges posed by time limitations, technological proficiency, and curriculum requirements. Cross-national studies indicate that educators' preparedness to utilize technology is significantly affected by their initial training and the support of policies [63, 70]. In Indonesia, localized methodologies like ethnomathematics have proven effective in contextual education [71] whereas in nations such as Portugal and South Africa, deficiencies in digital and citizenship curricula persist as obstacles [72]. Consequently, the creation of digital literacy media like BUCERI must incorporate not only interactive elements and captivating audiovisual narratives but also necessitate comprehensive training for educators and curriculum alignment that considers local context and technological preparedness.

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The results correspond with students' inclination towards interactive digital media (M = 3.95) and educators' requirement for media that is integrated with the curriculum framework (M = 4.27), collectively emphasizing the necessity for the development of pedagogically pertinent media. In this context, elements such as automated assessments (M = 4.31) and explicit competency mapping are essential as a connection between learning content and instructional objectives [17, 73]. The preliminary design of the BUCERI app incorporated these principles by utilizing adaptive learning pathways and organized assessments, which facilitate the attainment of literacy competencies, including reading fluency and creative writing skills [19]. Moreover, the incorporation of interactive narrative components (M = 4.30) and real-time audio (M = 4.17) exemplifies the multisensory strategy advocated by the curriculum, which has demonstrated efficacy in enhancing student motivation and reading comprehension [74].

The story creation feature in BUCERI not only facilitates the attainment of fundamental competencies but also garnered high ratings from students (M = 4.25) and was regarded by teachers as a significant medium for creative expression in the educational process. This method strengthens the concept of multiliteracies by allowing students to comprehend texts and generate their own narratives. [75] demonstrated that media facilitating narrative production enhances student engagement and fosters collaboration among students. The findings of Maureen, et al. [36] corroborate that digital story-based media enhances students' narrative structure and text production abilities. This feature promotes students' active participation as content creators rather than mere consumers, as highlighted by Cahyati, et al. [18] who underscored the significance of creativity in digital literacy. Consequently, the incorporation of this feature not only facilitates early literacy but also cultivates students' character as proactive and innovative learners in the digital age.

Data triangulation validated the significant demand for interactive and multisensory literacy media, evidenced by students' pronounced preference for interactive narratives (M = 4.30) and synchronous audio (M = 4.17). Studies on Articulate Storyline-based media corroborate these conclusions, illustrating its efficacy in fostering 21st-century competencies, creative cognition, and student involvement via audio-visual and case methodologies [76, 77]. Elements like gamification and interactive experiences have demonstrated the ability to foster engaging and significant learning in early literacy environments. BUCERI offers a solution that integrates curriculum, pedagogy, and technology via interactive narrative elements, synchronous audio, and story creation, enhancing student engagement (M = 3.95) and fulfilling teachers' requirements for pertinent and effective media (M = 4.27–4.42). Besides enhancing early literacy competencies and creative expression, BUCERI provides a media framework that conforms to national educational policies, including the School Literacy Movement, while tackling the issue of inadequate basic literacy as indicated by PISA and AKSI outcomes.

6. Conclusion and Suggestions

This study concludes that BUCERI, as an interactive digital literacy platform, effectively addresses pedagogical, technological, and curricular requirements by incorporating essential features such as interactive narratives (M = 4.30), synchronous audio (M = 4.17), and story creation capabilities (M = 4.25). These three features have been proven to increase student engagement while supporting the achievement of early literacy competencies that are in line with CP, TP, and ATP. These results emphasize the importance of developing learning media that are engaging, contextual, and responsive to teacher needs (M = 4.27–4.42), and contribute to strengthening digital literacy policies in Indonesia. To enhance development, it is advisable that BUCERI implement a training program for educators focused on technology integration, optimization of gamification elements, and content adaptation rooted in local wisdom to maximize the effectiveness of early literacy improvement at the elementary education level.

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Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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