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READIBUDDY: A Culturally Relevant Literacy Tool for Empowering Malaysian Girls

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ABSTRACT

Literacy development remains a critical challenge among young learners in rural Malaysia, particularly for girls who face sociocultural barriers, limited exposure, and a lack of relatable reading materials. Existing English language tools are often generic and fail to align with the linguistic needs and cultural realities of underserved communities. As a result, girls in Orang Asli and remote regions experience lower reading motivation and higher dropout rates. This study examined whether a culturally grounded, scaffolded digital literacy platform could improve English reading proficiency, motivation, and identity affirmation among rural Malaysian girls. To address this aim, the ReadiBuddy platform was developed and piloted over six weeks of classroom and home-based learning. ReadiBuddy features localized stories across three genres (Fantasy, Science, History), scaffolded by CEFR levels (A1–B2), bilingual toggling, pronunciation playback, comprehension quizzes, and a gamified interface. Teachers supported the implementation using a real-time dashboard and differentiated instruction tools. Findings revealed significant improvements in reading proficiency, learner engagement, and cultural connection. Students responded positively to the use of Malaysian female heroes and culturally familiar narratives, while teachers viewed the platform as a practical supplement for under-resourced classrooms. The results also reflect key principles in

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second language acquisition, including scaffolded comprehensible input, code-switching strategies, and the role of learner identity in literacy development. ReadBuddy contributes to SDG 4 (Quality Education), SDG 5 (Gender Equality), and SDG 10 (Reduced Inequality). It exemplifies a socially responsive and pedagogically sound innovation that bridges literacy gaps through engaging, inclusive, and contextually relevant digital learning, thus empowering a generation of confident, literate girls.

Keywords: Literacy; Reading Tool; Scaffolding; Malaysian Female Heroes; Rural Learners; Digital Learning

1. Introduction

Literacy is the ability to read and write; a tool for personal development of an individual^[1]. Globally, literacy rates are known as a key indicator of one's educational development in a nation. In the past 50 years, literacy rates worldwide have significantly increased from 68% in 1979 to 87% in 2022^[2]. Despite this progress, significant disparities in education persist across gender, geography, ethnicity, and socioeconomic status, leaving the most marginalized, particularly women and girls, disproportionately affected by low literacy. These pressing concerns, alongside the lack of access to quality education, have prompted the United Nations (UN) to seek meaningful solutions through the Sustainable Development Goals. Among the SDGs, SDG 4 (Quality Education) and SDG 5 (Gender Equality) urge the nations to ensure inclusive and equitable learning opportunities for all^[2,3].

In many low- and middle-income countries, literacy gaps are particularly visible along gender lines. Statistics highlight that in rural and remote regions, girls are more likely to drop out of school early, face reduced learning opportunities, and have limited access to reading materials in their mother tongue or second language^[4]. Cultural norms, domestic responsibilities, and early marriage further aggravate these disparities^[5]. As a result, even in areas where school enrollment for girls has improved, literacy outcomes remain low, especially in contexts where formal education is conducted in a language that is not the learner's first language^[6].

Technology-enhanced learning has emerged as a promising avenue for closing these gaps. Digital literacy tools ranging from mobile reading apps to AI-driven language learning platforms have been deployed worldwide to enhance reading proficiency, increase engagement, and bridge geographic divides^[7]. However, evidence suggests

that the impact of these tools is uneven when they lack cultural relevance, gender sensitivity, or adaptability to local educational contexts^[8]. A one-size-fits-all approach often fails to resonate with learners from marginalized communities, who may struggle to see themselves and their realities reflected in the content they consume^[9].

Malaysia has made commendable strides in improving overall literacy rates, with adult literacy estimated at 95% and youth literacy approaching universal levels^[10]. Nevertheless, these aggregate figures mask substantial disparities among rural, indigenous, and low-income communities. In rural Sarawak and Sabah, and among the Orang Asli communities of Peninsular Malaysia, literacy rates are significantly lower than the national average^[11]. Factors such as geographic isolation, infrastructural limitations, and economic constraints compound educational disadvantages, make access to quality reading materials and trained teachers more difficult^[12].

English is not only a second but sometimes a third language, after their mother tongue and Malay for many indigenous learners^[13]. While English proficiency is a stated priority of the Malaysia Education Blueprint (2013–2025), the resources used in rural schools are often urban-centric, Eurocentric, and disconnected from the lived experiences of these learners^[14]. For instance, reading passages that reference snow, Western holidays, or metropolitan lifestyles may be engaging to urban students but fail to resonate with rural children whose experiences differ vastly. This cultural disconnect reduces both comprehension and motivation to read, which in turn limits proficiency development^[15].

The literacy gap is further widened for indigenous and rural girls by sociocultural norms that may undervalue female education, limit girls' time for study due to household responsibilities, and curtail their participation in extracurricular activities that foster language skills^[16]. The lack of female role models in educational materials compounds the

problem: when girls rarely see characters like themselves, whether in terms of ethnicity, language, or lived experience, they may perceive reading as irrelevant or unrelatable^[17]. Many existing English reading resources are imported from foreign contexts, where the primary target is often the learners in urban settings. These materials tend to focus on topics, imagery, and idiomatic expressions unfamiliar to rural Malaysian learners, which contribute to a sense of alienation from the learning process^[18]. For girls, in particular, this disconnect can lead to decreased engagement, weaker language proficiency, and ultimately higher dropout rates^[15].

In recognition of the potential for technology to transform learning outcomes, the Malaysia Education Blueprint (2013–2025) calls for the integration of Information and Communication Technology (ICT) into all levels of schooling^[19]. Digital learning initiatives have expanded, with various ministries, NGOs, and private partners introducing online reading platforms, digital libraries, and interactive learning tools. However, many of these technology-based literacy tools remain generic, offering minimal localization^[20]. Key limitations include a lack of bilingual interfaces, which could facilitate code-switching strategies proven effective for EFL learners in multilingual environments^[21]. Next, the absence of contextualized narratives results in content that fails to reflect learners' cultural heritage, environment, and aspirations^[22]. Also, limited adaptive scaffolding is limited so reading materials do not align with learners' actual proficiency levels^[23]. Thus, this leads to either cognitive overload or under-stimulation.

The UNICEF Malaysia report highlights that effective literacy interventions for rural and indigenous communities must go beyond mere digitization of generic content^[24]. Successful programs integrate cultural identity to foster belonging, gender sensitivity to address inequities, and community-based approaches to sustain engagement and retention. Without such features, national literacy efforts risk leaving behind precisely those most in need, especially rural and indigenous girls.

Hence, there is an urgent need for a culturally responsive, gender-inclusive, and pedagogically sound digital literacy tool tailored to the realities of rural Malaysian girls. This is where ReadiBuddy, an interactive literacy platform, positions itself as a targeted solution. Unlike generic reading applications, ReadiBuddy incorporates localized stories,

scaffolded reading pathways, bilingual support, interactive comprehension tools, offline accessibility, and an educator dashboard. Not only does the tool directly address intersecting challenges of gender inequality, cultural disconnect, and lack of differentiated scaffolding, it was also designed to align with SDG 4 (Quality Education), SDG 5 (Gender Equality), and SDG 10 (Reduced Inequality).

In designing ReadiBuddy, particular attention was given to the ways learners acquire and engage with a second language. The platform draws on principles such as scaffolded learning within the Zone of Proximal Development (ZPD), the importance of comprehensible input, and the role of identity and representation in sustaining motivation among language learners. Features such as CEFR-aligned progression, bilingual toggling, and culturally grounded narratives were not only designed to support reading proficiency but also to nurture learners' confidence and sense of belonging in English literacy spaces. By integrating these features, ReadiBuddy aims to provide rural and indigenous girls with content that is both accessible and affirming, helping them see themselves as capable users of English and engaged participants in their own learning journey.

Problem Statement

Despite growing national and international emphasis on digital literacy, current English reading tools for young learners in Malaysia continue to fall short in addressing the unique needs of rural and indigenous communities, particularly for girls. Most available digital reading platforms are developed for broad, urban-oriented audiences and lack the contextual relevance necessary to engage learners whose lived reality differs significantly from mainstream narratives^[25]. For many rural girls, these tools fail to reflect their socio-cultural environment, linguistic background, or everyday experiences, resulting in learning content that feels distant and unrelatable.

Furthermore, these platforms often provide limited personalization and insufficient support for learners with low language proficiency, which is a common challenge in communities where English is a second or third language. Many existing tools operate on static difficulty levels and do not adapt to individual learners' progression, making it harder for struggling readers to keep up and for more advanced learners to be challenged appropriately. Additionally, female role

models, especially those of Malaysian heritage, are largely absent from these resources, perpetuating a lack of representation that can negatively impact girls' self-esteem, reading motivation, and long-term educational engagement^[15].

The problem is compounded by a lack of scaffolded progression. Existing reading apps often present content that is either overly simplistic, limiting linguistic growth, or too advanced, creating frustration and disengagement. Without graduated difficulty levels aligned with frameworks such as the Common European Framework of Reference for Languages (CEFR), learners are not adequately supported in their literacy development journey^[26].

Teachers in rural and indigenous schools have repeatedly expressed the need for digital tools that not only teach language but also foster cultural identity and educational purpose^[25]. They emphasize that effective literacy tools should integrate local cultural narratives, allow bilingual or code-switching features to ease comprehension, and be accessible in low-connectivity environments to overcome infrastructural limitations. Without such an inclusive and context-aware design, the digital divide in literacy education will continue to widen, leaving behind those most in need.

In response to these pressing challenges, this study aims to:

1. Design and develop a culturally inclusive and interactive reading platform that features localized stories centered on Malaysian female heroes to enhance representation and relevance.
2. Improve English literacy proficiency among young learners through the integration of scaffolded reading content aligned with CEFR levels, incorporating pronunciation tools, comprehension activities, and bilingual support.
3. Promote learner motivation, school retention, and classroom integration by offering accessible digital learning both online and offline, while supporting educators through monitoring dashboards and community-based reading tools.

This approach directly addresses the intersecting issues of literacy inequality, gender representation, and digital accessibility, aligning with Sustainable Development Goals 4 (Quality Education), 5 (Gender Equality), and 10 (Reduced Inequality). The proposed solution seeks to improve reading skills and empower young girls as active, confident learners

by embedding cultural identity within digital literacy tools

2. Literature Review

The integration of educational technology (EdTech) into literacy development has gained increasing attention in recent years, particularly in contexts where access to quality learning resources is uneven. While digital platforms offer opportunities for personalization, feedback, and expanded access, their effectiveness depends heavily on how they align with established pedagogical frameworks, such as scaffolding, as well as how they respond to learners' cultural and linguistic realities. In the field of second-language reading, research highlights the critical role of scaffolding, bilingual supports, and teacher guidance in shaping meaningful outcomes. At the same time, gender remains a key dimension of literacy equity, with studies emphasizing the importance of representation and cultural relevance in motivating girls to persist in their educational journeys. This review examines relevant work on EdTech, scaffolding, gender, bilingualism, and second-language reading, providing the theoretical and empirical foundation for understanding the design and impact of ReadBuddy as a localized, culturally inclusive literacy platform.

2.1. EdTech and Literacy

The past three decades of research have shown that well-designed digital tools can improve foundational literacy by increasing time on tasks, providing immediate feedback, and personalizing practice^[27,28]. However, studies have highlighted persistent challenges in EdTech adoption for literacy. While Malaysian students showed positive attitudes toward ICT integration in English language classrooms^[29], the lack of localized content and contextualized pedagogy limited its impact^[30]. More recent work noted that many digital literacy platforms used in rural Sabah and Sarawak were imported, heavily Eurocentric, and poorly adapted to local cultural and linguistic needs^[31,32]. Similarly, another study emphasized that Orang Asli learners often struggle with English reading apps because they fail to incorporate bilingual supports or reflect students' lived experiences^[33]. In another case, although mobile-assisted language learning (MALL) tools enhanced engagement, they worked best when combined with culturally relevant content and teacher mediation^[34].

Without these, “one-size-fits-all” platforms risk reinforcing the very inequities they aim to address. Therefore, scholars stress the importance of offline access, lightweight design, and content localization in Malaysian rural contexts to curb the digital divide and inequality. Readibuddy positions itself within this evidence base as an EdTech intervention that pairs lightweight delivery and teacher analytics with localized narrative content centered on Malaysian female heroes, offering both technological adaptability and cultural resonance.

2.2. Scaffolding and the Zone of Proximal Development

Vygotsky’s (1978) ZPD underpins contemporary scaffolding, which is learners’ progress from assisted to independent performance through carefully sequenced supports. In second language (L2) literacy, scaffolding maps to leveled texts, pre-teaching vocabulary, modeled reading, guided practice, and fading supports^[35]. When scaffolding is aligned to recognized proficiency frameworks, for instance, based on CEFR, learners benefit from calibrated input that is neither too easy nor overwhelmingly difficult^[36]. Digital environments can operate scaffolding by chunking texts, layering hints, delivering pronunciation models, and routing learners along adaptive pathways^[35]. The literature further notes that scaffolding is most powerful when assessment is integrated; it enables rapid cycles of practice–feedback–adjustment^[37]. Readibuddy’s three-stage progression within CEFR bands and in-app pronunciation and quiz feedback reflect these principles.

2.3. Gender, Representation, and Culturally Relevant Pedagogy

Representation affects motivation, identity, and persistence. The “mirrors and windows” metaphor argues that readers need texts that reflect their identities (mirrors) and broaden horizons (windows)^[38]. Culturally relevant and sustaining pedagogies show improved engagement and comprehension when learners recognize their communities, languages, and histories in texts^[39]. Studies with EFL learners report that cultural familiarity enhances inferencing, background knowledge activation, and reading comprehension^[40,41]. Gender-responsive programs that foreground female role models are linked with higher girls’ self-efficacy

and school continuation, particularly where norms undervalue girls’ education^[2]. Readibuddy operationalizes this strand of evidence: it aims to strengthen reading motivation and identity for girls who are often missing from mainstream English texts by centering Malaysian female heroes across genres.

2.4. Bilingualism and Second-Language Reading

Bilingualism plays a crucial role in shaping literacy development, especially in contexts where English is learned as a second or third language. Research shows that supporting learners’ first language (L1) while they acquire a second language (L2) strengthens comprehension, vocabulary transfer, and overall reading confidence^[42]. In Malaysian classrooms, where students often juggle Bahasa Malaysia, indigenous languages, and English, bilingual approaches act as a bridge, enabling learners to make meaning in L2 through the scaffolding of L1^[43]. Alternating between languages allows learners to activate prior knowledge and reduce cognitive load when approaching new vocabulary or syntactic structures^[44].

In the digital learning context, platforms that integrate bilingual glosses, dual-language texts, or toggling features help lower anxiety and increase learner autonomy^[44]. Readibuddy’s bilingual interface, which allows learners to switch between English and Bahasa Malaysia, reflects these pedagogical insights. The platform creates a less intimidating environment for learners, particularly those in rural and indigenous communities, and builds the confidence necessary to persist in English reading activities by providing immediate access to L1 support.

3. Materials and Methods

This research employed a design-based research (DBR) methodology to iteratively develop, implement, and evaluate the Readibuddy platform. DBR is well-suited for educational technology innovations as it allows researchers to address complex problems in real-world contexts while refining both theory and practice^[45].

The study followed a mixed-methods approach, combining both qualitative and quantitative data collection methods to provide a comprehensive understanding of the platform’s development, usability, and impact on learners’ liter-

acy outcomes.

Participants included 30 young female learners, aged 9 to 12, from a rural primary school in Negeri Sembilan. This school was selected based on their demographic relevance to the target group (rural, low-access, indigenous populations). Additionally, 4 English language teachers participated in usability testing and feedback sessions.

The project was conducted over three phases: (1) design and development, (2) pilot implementation, and (3) evaluation and refinement.

3.1. Phase 1: Design and Development

The first phase centered on the conceptualization and creation of Readibuddy, guided by a DBR framework to ensure the platform was both technologically functional and pedagogically grounded. The process began with a Needs Analysis, where surveys and informal consultations with rural schoolteachers highlighted key challenges, which include a shortage of localized English materials, limited access to libraries, and low learner motivation. This informed the Content Development stage, where stories were crafted around Malaysian female heroes. The narratives were carefully scaffolded to align with CEFR levels, ensuring age-appropriate progression in vocabulary and reading tasks. In the Feature Integration stage, functions, such as pronunciation playback, comprehension quizzes, achievement badges, and a bilingual toggle (English–Bahasa Malaysia) were embedded to support motivation, accessibility, and skill acquisition. Finally, Iterative Testing was conducted with a small group of students, allowing the research team to refine usability, navigation, and offline accessibility before moving to the pilot phase.

3.2. Phase 2: Pilot Implementation

The second phase focused on field testing Readibuddy in selected rural primary schools, particularly within underserved and indigenous communities. The six-week pilot involved 30 female students aged 9–12, together with their English teachers. Participants were chosen based on their literacy levels and their limited access to print resources.

Readibuddy was used both during scheduled classroom sessions and as part of self-directed learning at home. Teachers introduced one story per week, rotating across the

three genres available in Readibuddy: Fantasy, Science, and History. Each genre contained stories at the beginner, intermediate, and advanced levels, which were mapped to CEFR levels from A1 to B2. This allowed teachers to differentiate content based on student proficiency. Each story was structured into three pedagogical stages: Pre-reading, Reading, and Post-reading. In the Pre-reading stage, learners were introduced to key vocabulary and pronunciation through interactive audio clips, which helped establish familiarity with unfamiliar terms before engaging with the full text. The Reading stage presented the complete story, supported by synchronized audio narration. Students could read while listening, enhancing both comprehension and pronunciation. At this stage, they were also encouraged to mimic the audio for spoken practice using the platform’s playback function. In the Post-reading stage, learners answered comprehension questions aligned with the story to assess their understanding and encourage reflection. In-class sessions typically focused on the pre-reading and reading stages, guided by the teacher. Discussions on vocabulary, themes, and character relevance were integrated into the lesson, often contextualized using local examples to boost engagement. Homework tasks encouraged students to complete the post-reading stage independently, supported by optional heroine missions and journaling activities. Teachers used Readibuddy’s educator dashboard to monitor progress in real time and provide targeted feedback, making it easier to identify learners who needed additional support.

To measure impact, pre- and post-tests were conducted using standardized English reading assessments that evaluated vocabulary, sentence structure, and comprehension. In addition to test scores, app analytics were collected to capture usage patterns, stage progression, and feature interactions such as the frequency of pronunciation playback use. Students also maintained reflective journals, documenting their reading experiences, challenges, and sources of motivation. Meanwhile, semi-structured interviews with teachers provided insights into instructional support, resource supplementation, and linguistic accessibility.

3.3. Phase 3: Evaluation and Refinement

The final phase centered on a comprehensive evaluation of Readibuddy’s effectiveness, drawing on both quantitative and qualitative data. Pre- and post-test scores were

analyzed using a paired samples t-test to determine statistical significance in learners' literacy gains. In parallel, app analytics were examined to identify trends in learner engagement, progression across stages, and usage of interactive features. For the qualitative element, a thematic analysis of student journals and teacher interviews was conducted. The qualitative data from journals and interviews were thematically analyzed using Braun and Clarke's six-phase framework^[46]. Recurring codes were organized into overarching themes, including motivation, identity connection, usability, confidence, instructional support, and linguistic accessibility. These themes provided insight into not only how learners interacted with the platform but also how teachers integrated it into their pedagogical practices. Findings from this phase informed concrete refinements to the platform.

3.4. Ethical Consideration

The study was approved by the Institutional Review Board of INTI International University, Malaysia. As the research involved children aged 9–12, informed parental consent was obtained prior to participation. Teachers also provided written agreements to support classroom-based implementation. To safeguard participant rights, confidentiality and anonymity were maintained throughout the study. Student reflections and teacher interviews were coded to remove identifiable information, and participation was entirely voluntary, with the option to withdraw at any point.

4. Results

The study revealed both quantitative and qualitative insights into the effectiveness and impact of the ReadBuddy platform in improving English literacy and learner engage-

ment among rural Malaysian girls.

4.1. Quantitative Findings

The quantitative findings are presented in pre-test and post-test scores. Pre- and post-test comparisons demonstrated a statistically significant improvement in learners' reading proficiency after using ReadBuddy. Results from a paired samples t-test, as shown in **Table 1**, indicated that average scores increased substantially, from $M = 41.6$, $SD = 10.2$ in the pre-test to $M = 67.4$, $SD = 12.8$ in the post-test, $t(29) = 8.47$, $p < 0.001$. This large effect suggests that the scaffolded, CEFR-aligned reading approach integrated in the web-based tool had a meaningful impact on learners' literacy growth. The improvements were not confined to a single aspect of reading; rather, they reflected gains in vocabulary acquisition, syntactic awareness, and comprehension ability, which are critical foundations for second language development.

To further evaluate the magnitude of improvement, Cohen's d was calculated. The effect size was 2.23, which represents a very large effect according to Cohen's benchmarks. This indicates that the intervention had a substantial and practically meaningful impact on learners' literacy development, not just a statistically significant one.

Besides test scores, app analytics further corroborated these findings and offered insight into learner engagement patterns. More than 85% of users successfully advanced from Stage 1 to Stage 2 during the six-week pilot. This score has highlighted the effectiveness of the scaffolded learning progression. The gradual increase in task complexity appeared to support learners across varying proficiency levels. It ensured that weaker readers were not left behind while stronger readers remained challenged.

Table 1. Paired Samples t -Test Results on Learners' Reading Proficiency.

Measure	Mean (M)	Standard Deviation (SD)
Pre-Test Score	41.6	10.2
Post-Test Score	67.4	12.8
T -Value	8.47	
P -Value	<0.001	
Cohen's d	2.23	

Interaction data also revealed meaningful engagement with the web-based tool's oral skills features. On average, students used the pronunciation playback function 3.2 times

per session, demonstrating both persistence and autonomy in practicing difficult words or sentences. This pattern suggests that learners were actively seeking to refine their pronuncia-

tion rather than passively consuming content. This can also be noted as an important marker of self-directed learning behavior. The comprehension quiz activity also reflected positive levels of motivation and task commitment. With an average completion rate of 76%, learners consistently engaged with the app's formative assessment features. Teachers noted that the quizzes reinforced comprehension and encouraged learners to revisit stories multiple times. This has resulted in promoting deeper reading engagement and repetition-based learning, both of which are essential for second-language literacy development.

Based on the quantitative results, it is proven that Read-iBuddy not only improved learners' measurable reading performance but also fostered positive learning habits, such as independent practice, repeated exposure, and sustained engagement with literacy tasks. These quantitative outcomes also strengthen the case for culturally contextualized, scaffolded digital tools as effective interventions in addressing literacy challenges in rural and indigenous Malaysian communities.

4.2. Qualitative Findings

The qualitative findings of this study encompass a thematic analysis of students' reflective journals and semi-structured interviews with teachers.

4.2.1. Findings from Student Journals

The findings from students' reflective journals brought to the surface significant themes such as motivation, identity connection, usability, and confidence. These themes provide deeper insight into literacy development and learner engagement in rural and indigenous classrooms.

Motivation emerged as one of the most prominent themes across student reflections. Learners frequently described their reading experiences as "*fun*" and "*rewarding*", with many attributing this enjoyment to the platform's gamified elements, such as digital badges, progress tracking, and story-based missions. One student wrote, "*I want to finish more stories to get the badge*," illustrating how achievement-based rewards fostered intrinsic motivation to continue reading beyond classroom requirements. This gamification encourages sustained engagement and promotes goal-setting behaviors, which are critical for developing self-directed learning habits in low-literacy contexts.

The theme of identity connection emerged strongly, particularly in the interplay between localized content and learner engagement. Teachers reported a visible increase in enthusiasm when students encountered heroines whose cultural, linguistic, or geographic backgrounds mirrored their own experiences. One teacher remarked, "*It's the first time they see girls like themselves in English stories*." This observation underscores the transformative potential of culturally relevant narratives, which can validate learners' identities and strengthen their sense of belonging in the academic space. Read-iBuddy conveyed literacy content and subtly reinforced gender empowerment messages that resonated with the students' realities by integrating Malaysian female heroes into the storyline.

The third theme is usability, and it reflected consistent feedback from both students and teachers regarding the app's intuitive design and user-friendly navigation. Students reported minimal difficulty in accessing stories, quizzes, and pronunciation tools, even without prior experience using similar digital learning platforms. Teachers emphasized that the simple interface reduced the need for extensive onboarding, which enabled learners to focus more on the content rather than the technical operation.

Accessibility was also a critical sub-theme, with offline functionality receiving repeated praise. This feature proved particularly valuable in areas with unstable internet connections, where uninterrupted access to learning materials is often a significant challenge. Teachers in remote regions emphasized that the offline mode ensured continuity of literacy practice, mitigating the risk of learning loss during periods of poor connectivity. This functionality also aligns with broader digital inclusion strategies outlined in the Malaysia Education Blueprint (2013–2025).

Finally, the theme of confidence was closely tied to the app's pronunciation playback feature. Several students who were initially hesitant to read aloud in front of peers reported feeling more comfortable after using the tool to rehearse privately. This self-paced, low-pressure environment allowed learners to experiment with pronunciation, self-correct, and gradually build oral fluency. Teachers observed that students who previously avoided participation in oral activities began contributing more actively during classroom discussions and reading exercises. Over time, this increase in confidence was not only reflected in oral performance but

also in students' willingness to tackle more complex reading tasks, suggesting a broader transfer of skills and self-belief beyond the app's immediate learning environment. Under the motivation theme, students frequently described their reading experiences as "*fun*" and "*rewarding*," largely due to gamified features such as badges and story-based missions. One learner reflected, "*I want to finish more stories to get the badge*," showcasing how reward elements encouraged sustained engagement.

4.2.2. Findings from Teachers' Interview

Thematic analysis of the teacher interviews revealed three key themes, namely targeted instructional support, resource supplementation, and linguistic accessibility. Collectively, these themes highlight how Readibuddy not only supported learners directly but also transformed teachers' instructional practices in under-resourced classrooms.

Under the theme of targeted instructional support, teachers consistently reported that the educator dashboard was a valuable tool in helping them identify struggling learners. Through real-time access to individual progress and quiz performance, teachers were able to adjust classroom strategies and provide timely interventions. One teacher shared, "*I could see who was stuck at Stage 1 and guide them personally the next day*," highlighting the dashboard's role in personalized learning support.

In terms of resource supplementation, educators in rural and under-resourced settings noted that Readibuddy served as a much-needed addition to classrooms with limited print materials. In some cases, the app became the primary source of English reading content, especially in areas where libraries or physical storybooks were unavailable. One participant remarked, "*We don't have enough books, especially ones that are suitable for our girls. This app fills that gap*."

The final theme, linguistic accessibility, emerged in discussions about the platform's bilingual interface, which alternates between English and Bahasa Malaysia. Teachers emphasized that this feature eased students into English literacy by allowing code-switching, a common strategy in multilingual Malaysian classrooms. This helped reduce anxiety around English learning and allowed students to draw upon their first language for support. As one teacher observed, "*When they don't understand something in English, they check the Bahasa version and feel more confident to continue*."

5. Discussion

Both quantitative and qualitative findings of this study emphasize Readibuddy's role as both an instructional aid and a culturally responsive learning tool that adapts well to different classroom contexts. The findings demonstrate that a platform intentionally designed with scaffolded content, bilingual accessibility, and culturally relevant narratives can meaningfully enhance literacy outcomes for young girls in rural Malaysian communities^[47]. At the same time, it also supports teachers' instructional practices^[48].

The post-test scores improved significantly. Students also showed strong signs of positive engagement. Together, these results highlight the platform's ability to tackle common literacy challenges in under-resourced environments. The reading content was scaffolded and aligned with CEFR levels. This design closely reflects Vygotsky's ZPD. In this approach, learners first complete tasks with guidance, and then gradually move to tasks they can handle on their own. Readibuddy gave students a clear step-by-step pathway by sequencing the reading tasks from simple to complex. This approach strengthened their reading competence and boosted their confidence over time. Previous studies have also proven that scaffolding paired with relevant and comprehensible input increases reading comprehension and supports long-term retention in second language acquisition (SLA)^[49]. The interactive feedback features such as pronunciation playback, comprehension quizzes, and story missions help students to assess their progress as well as actively engage in metacognitive monitoring of their own progress^[50].

Besides technical scaffolding, this study highlights the motivational and identity-based impact of culturally representing narratives in second language learning. Localized stories featuring Malaysian female heroes provided both linguistic input and cultural affirmation. Previous studies highlighted that when learners see characters who reflect their cultural, linguistic, and gender identities, their motivation and reading engagement improve^[51,52]. These findings align with Khataee and Dowlatabadi's research on cultural familiarity, which demonstrated that embedding reading content in a familiar sociocultural context improves comprehension, language performance, and cultural competence^[53]. Moreover, Readibuddy's design also reflects Bishop's study on "mirrors and windows" framework^[38]. The stories in this reading web-based tool mirror learners' own identities and

provide windows into new perspectives.

These insights also closely align with Norton's theorization of language learning as a social practice shaped by identity, power, and access^[54]. In her work, Norton argues that a learner's investment in language learning is not merely about motivation, but about the desire to participate in social worlds that are meaningful to them. For many of these rural and indigenous girls, mainstream English materials often fail to represent their imagined identities, and this exclusion can undermine their sense of belonging in English literacy spaces. Readibuddy addresses this by offering culturally relevant narratives that position learners as central, visible, and empowered within English texts. Learners may begin to view themselves as legitimate English users with a rightful place in the language-learning community by seeing heroines who look, speak, and live a life just like them. This sense of legitimacy is essential in SLA, particularly for learners from marginalized contexts, where language often intersects with social inequality. When rural and indigenous girls encounter protagonists who share their cultural background, language patterns, and aspirations, their engagement deepens and their persistence in reading tasks increases. This is particularly important in Malaysia, where most of the English resources often fail to capture the lived experiences of these communities and disconnect learners from the content.

The qualitative data from teacher interviews further reveal that Readibuddy's bilingual interface and offline functionality directly mitigate two persistent barriers in rural education: linguistic insecurity and inconsistent internet access. The bilingual toggle feature supported code-switching, a natural and effective strategy in Malaysian multilingual classrooms, enabling learners to use their first language as a scaffold for acquiring English^[55]. This design not only aligns with principles of culturally sustaining pedagogy, which value and incorporate learners' linguistic repertoires^[39], but also reflects applied linguistics research that views translanguaging and code-switching as pedagogically valuable in SLA^[21,55]. In this context, Readibuddy's bilingual support functions as more than just a usability feature; it becomes a linguistically grounded intervention that enhances comprehensible input advocated by Krashen's input hypothesis, reduces learner anxiety, and supports interlanguage development^[36]. In addition, with the offline capability, students could continue learning despite infrastructural limitations

by addressing the digital divide that often excludes rural learners from participating in technology-enabled education. This was in a similar view by Bandyopadhyay, Bardhan, Dey, and Bhattacharyya on bridging the education divide using social technologies^[56] that alternatives such as offline features help students attain the goal of learning despite online disruptions. Teachers also viewed the platform as a solution to chronic shortages of age-appropriate, gender-relevant English reading materials in their schools^[57].

Another important dimension of the findings lies in the platform's educator dashboard, which offered real-time, actionable insights into individual learner performance. This feature supports formative assessment, an instructional approach that enables teachers to intervene promptly with targeted support, as emphasized by Irons and Elkington^[58]. This way, Readibuddy benefits learners and functions as a teacher development tool by strengthening educators' digital literacy and data-informed teaching practices. This aspect aligns with calls in the literature for ongoing teacher training in digital pedagogy and for integrating such tools into professional learning communities^[59,60]. Readibuddy enables teachers in resource-constrained settings to apply differentiated instruction without additional workload burdens by simplifying access to learner progress data.

From a policy perspective, the designs and outcomes of Readibuddy align with SDG 4 (Quality Education), SDG 5 (Gender Equality), and SDG 10 (Reduced Inequality). The platform provides inclusive, bilingual, and culturally relevant literacy materials that are usable both online and offline, thereby reducing dependency on costly infrastructure and expanding access to marginalized learners. The Ethiopian case study highlights how barriers such as inadequate teacher training, lack of resources, and cultural prejudice hinder inclusive education in developing countries^[61]. Similar systemic constraints exist in Malaysia's rural and indigenous communities^[62]. Readibuddy addresses several of these challenges simultaneously, suggesting a scalable model for inclusive education in comparable contexts by combining content localization, gender representation, and scaffolded literacy progression.

In the broader EdTech landscape, many solutions are developed for urban, commercially viable markets, leaving rural and marginalized learners underserved. The findings here contribute to the growing body of literature advocat-

ing socially conscious and culturally grounded educational technology. The platform's integration of cultural narratives, linguistic inclusivity, and teacher support functions represents a holistic approach to literacy intervention that could inform similar initiatives in Southeast Asia and beyond. These findings also emphasize the app's versatility as both an instructional aid and a culturally responsive learning tool for diverse classroom contexts. In sum, these results urge calls in the literature for educational technologies that are innovative, socially conscious, culturally grounded, and scalable. While many global EdTech solutions are urban-centric and commercially driven, ReadiBuddy offers a sustainable, socially responsive alternative for underserved communities.

6. Conclusions

This study highlights the transformative potential of ReadiBuddy, an interactive and culturally inclusive literacy platform designed to improve English language proficiency among Malaysian girls in underserved communities. The integration of scaffolded CEFR-aligned content, representation through Malaysian female heroes, and interactive digital features such as pronunciation feedback and comprehension tasks demonstrated significant gains in learner engagement, motivation, and reading achievement. Teachers also found the platform beneficial for classroom integration, formative assessment, and differentiated instruction.

The implications of this study are both educational and societal. For educators, ReadiBuddy offers a practical tool to differentiate instruction and engage struggling readers in meaningful, contextually relevant ways. The practical implementation of ReadiBuddy followed a scaffolded literacy cycle, where learners advanced from simple to more complex texts through structured stages. Teachers played a central role in this process, introducing stories, modeling pronunciation, and guiding comprehension discussions. Students are engaged with the platform individually or in small groups, using features such as pronunciation playback, bilingual toggling, and comprehension quizzes to reinforce independent learning. Teachers utilized the educator dashboard to track progress in real time, identifying learners who required additional support. These insights enabled differentiated instruction, allowing teachers to adapt classroom activities, assign follow-up tasks, or provide one-on-one as-

sistance. In this way, the platform functioned not only as a digital literacy tool but also as an integrated teaching aid that supported classroom pedagogy and formative assessment.

For policymakers and NGOs, ReadiBuddy provides a scalable, socially conscious model for reducing gendered literacy gaps and enhancing digital equity, particularly in rural and indigenous settings. Its alignment with Sustainable Development Goals (SDG 4: Quality Education, SDG 5: Gender Equality, and SDG 10: Reduced Inequality) strengthens its global relevance by addressing systemic educational inequalities. On a societal level, empowering girls with literacy skills not only enhances their educational outcomes but also contributes to broader goals of gender empowerment and social mobility.

Despite promising results, this study is not without limitations. First, the research was conducted over a short pilot period. The six-week duration was selected to align with the school calendar and minimize disruption to regular instruction. Short-term interventions are common in EdTech pilot studies, allowing researchers to capture immediate literacy gains and patterns of engagement. Importantly, the statistically significant improvements observed within this timeframe suggest the platform's potential to produce impact even in the short term. Second, the sample size of 30 participants reflects the pilot nature of this study, which aimed to test the feasibility, usability, and initial impact of the ReadiBuddy platform in a real-world classroom setting. In design-based and exploratory educational research, smaller samples are often used to allow closer monitoring of intervention fidelity and to gather rich qualitative insights alongside quantitative measures. While the sample limits generalizability, it provides valuable early evidence of effectiveness, which forms the basis for scaling up to larger trials. Third, this study did not include a control group, which limits the ability to make strong causal claims about the effectiveness of the ReadiBuddy platform. While the significant gains observed in literacy outcomes suggest a promising impact, these improvements cannot be attributed solely to the intervention without comparison to a non-treatment group. As an exploratory pilot study, the primary focus was on feasibility, usability, and initial learner engagement. Next, while teachers reported positively on the app's usability, not all educators may possess the same level of digital readiness, potentially limiting effective implementation. Finally, the study

primarily focused on English literacy, leaving unexplored the potential for cross-linguistic transfer or the integration of other subjects (e.g., science, mathematics) into the Read-iBuddy framework.

Based on these findings and limitations, several recommendations are proposed. First, Read-iBuddy should be expanded across Malaysian primary schools, with priority given to Orang Asli and low-resource areas where literacy gaps are most pressing. Second, dedicated teacher training modules should be developed to ensure educators are well-equipped with both digital skills and pedagogical strategies for effective classroom integration. Third, longitudinal studies are needed to examine long-term literacy outcomes, learner retention, and the platform's impact on school continuation rates, particularly among rural girls. Fourth, the adaptability of Read-iBuddy should be explored in other linguistic and cultural contexts, positioning it as a potential global model for localized and inclusive literacy solutions. Additionally, the platform should incorporate assistive features such as text-to-speech, adaptive scaffolding, and gamified challenges to enhance accessibility for diverse learners and sustain engagement over time. Finally, strategic partnerships with ministries of education, NGOs, and international development agencies are essential to co-develop localized content, ensure sustainability, and embed Read-iBuddy within national literacy strategies.

In summary, Read-iBuddy exemplifies how localized, equity-driven innovation can reshape literacy development for marginalized learners. By bridging cultural identity, gender empowerment, and digital inclusion, it demonstrates not only immediate educational benefits but also the potential for long-term social transformation. While further refinement and expansion are needed, the platform offers a scalable pathway toward literacy equity, ensuring that the girls most often left behind are finally given the tools to thrive as confident learners and future changemakers.

Author Contributions

For this research article, Conceptualization, K.R., N.I.K. and J.X.M.X.; methodology, K.R., N.I.K., and J.X.; software, K.R. and N.I.K.; validation, H.H., S.A.D., and G.R.C.C.; formal analysis, K.R., N.I.K., and J.X.M.X.; investigation, K.R., N.I.K., and J.X.M.X.; resources, H.H.;

data curation, K.R., N.I.K., and J.X.M.X.; writing—original draft preparation, K.R., N.I.K., and J.X.M.X.; writing—review and editing, K.R., N.I.K., J.X.M.X., S.A.D. and G.R.C.C.; visualization, J.X.M.X.; supervision, H.H., S.A.D., and G.R.C.C.; project administration, K.R. All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

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Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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