



GAMIFIED EDUCATIONAL APPS AND READING COMPREHENSION IN HOME-SCHOOLED CHILDREN: AN EXPLORATORY MIXED-METHODS CASE STUDY

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Abstract: Many children now encounter stories on digital screens rather than on printed pages, yet limited empirical evidence exists regarding how gamified reading applications support comprehension in home schooling environments. Addressing this gap, this small scale mixed methods case study examined a four weeks intervention involving selected gamified reading applications used by two home schooled children aged ten and eleven. A standardized reading comprehension test was administered before and after the intervention to provide descriptive indicators of change in overall comprehension and three subskills, namely vocabulary, literal comprehension, and inferential comprehension, while semi structured interviews with the children and their parents were thematically analysed to explore learning experiences, engagement patterns, and contextual factors shaping app use. In this exploratory study with two participants, overall comprehension scores increased from a mean of 57.5 before the intervention to 74.0 afterwards. Vocabulary scores rose from 53.5 to 74.0, literal comprehension from 60.0 to 78.0, and inferential comprehension from 50.0 to 66.0, indicating observable descriptive gains across the three components of reading comprehension during the intervention period. Qualitative findings suggested increased motivation and sustained engagement with reading tasks, while parents emphasized that active guidance was often required to redirect attention from game rewards toward text meaning and deeper comprehension processes. Taken together, the findings provide preliminary and context specific insights from a rarely documented home schooling setting. Rather than offering generalizable conclusions, this study presents exploratory evidence that gamified reading applications may support certain aspects of reading development when their use is regular, text focused, and accompanied by parental scaffolding, while also generating hypotheses and nuanced considerations for parents, educators, and educational technology designers interested in integrating gamified tools into home based literacy practices.

Keywords: *gamified educational apps; reading comprehension; home-schooled children; vocabulary development; digital literacy.*

INTRODUCTION

Children now often spend more than two to three hours a day on digital devices, while international assessments continue to show worrying levels of reading comprehension among school-age learners (OECD, 2019). For many young readers, especially those educated at home, stories and information are encountered on glowing screens long before they hold a printed chapter book in their hands. Reading is increasingly intertwined with mobile devices, playful interfaces, and game

like experiences that promise to make literacy more engaging than traditional worksheets or textbooks. At the same time, concerns remain about whether this digital turn supports the deep, sustained reading needed for comprehension, or whether it simply encourages superficial clicking and skimming across fragmented texts (Gee, 2003). These tensions are particularly visible in home based learning environments, where parents and caregivers rather than classroom teachers

orchestrate literacy activities and make decisions about which apps and platforms are used.

Reading comprehension itself is a complex construct that involves vocabulary knowledge, the ability to extract literal information from text, and the higher order capacity to draw inferences and integrate information with prior knowledge (Grabe, 2009). These components can also be interpreted through widely discussed theoretical models of reading comprehension, such as the Simple View of Reading, which conceptualizes comprehension as the result of interactions between decoding processes and broader linguistic comprehension abilities. Within this perspective, vocabulary knowledge contributes to linguistic understanding, literal comprehension reflects the ability to access explicitly stated textual information, and inferential comprehension represents more advanced integration processes that connect textual clues with prior knowledge and contextual reasoning. Framing reading comprehension in this way provides a useful lens for examining how different components of comprehension may develop differently during digital learning experiences. For children in late primary years, around ten to eleven years old, progress in these components is critical as they transition from learning to read toward reading to learn in more demanding subject areas.

Home-schooled learners share similar developmental demands with their peers in formal schooling but often encounter different social and instructional conditions, shaped by more individualized routines, varied parental expertise, and uneven access to print and digital resources (Ray, 2017). Educational technologies, including gamified reading applications, are widely used to support literacy, yet their impact on comprehension is not always evaluated systematically. Evidence from meta-analyses points to heterogeneous effects on reading comprehension and highlights the importance of cognitive and strategy-based approaches for improving literacy outcomes (Silverman et al., 2024; Murphy & Arciuli, 2024). For instance, web-based intelligent tutoring systems that teach text-structure strategies have enhanced reading comprehension among struggling readers (Wijekumar et al., 2019), and explicit text-structure instruction has been shown to be both feasible and beneficial for younger learners who are at risk (Williams et al., 2016). Digital phonemic-awareness programs, such as GraphoGame, have also produced gains in word

reading and related skills (Souza et al., 2022), illustrating the potential of educational technology when it is closely aligned with targeted literacy components. Taken together, these findings are consistent with broader reviews that report mixed yet meaningful gains across digital literacy interventions and underscore the need for systematic monitoring and careful attention to implementation fidelity (Silverman et al., 2024).

A growing body of research on digital games and gamified learning for language and literacy reports gains in motivation, time on task, vocabulary acquisition, and, in some cases, reading comprehension (Ratinho & Martins, 2023; Al-Hoorie & Albijadi, 2024; Li & Chu, 2020; Julita, 2024). Self-determination theory helps explain these effects, since gamified features can support autonomy, competence, and relatedness, which in turn sustain engagement (Ratinho & Martins, 2023; Al-Hoorie & Albijadi, 2024). In school contexts, game-like elements increase engagement with reading tasks and provide repeated language input, thereby supporting vocabulary growth and basic comprehension (Li & Chu, 2020; Julita, 2024). However, most of this work has been conducted in formal classrooms with larger samples, and home-school contexts remain underexplored, indicating a need for studies and designs that are adapted to home routines (Ratinho & Martins, 2023; Yang et al., 2024). Emerging evidence from mobile and augmented reality based gamification is promising for home-like settings, as AR-based learning has been shown to enhance vocabulary (Hung & Yeh, 2023), mobile gamification improves speaking skills (Yang et al., 2024), and literacy gains have been documented in gamified interventions such as word-wall and morphological awareness programs (Rahmat et al., 2024; Qiao et al., 2022).

More specifically, empirical work on gamified reading has tended to focus on general literacy outcomes or motivational variables without disaggregating subskills such as vocabulary, literal comprehension, and inferential comprehension, and without closely examining how children and parents actually use the apps over time (Li & Chu, 2020; Chen et al., 2018; Grasparil & Hernandez, 2015). Vocabulary and lexical processing, for example, can diverge from overall comprehension in gamified contexts, which underscores the need to look beyond global scores (Grasparil & Hernandez, 2015). Likewise, gamified e books can yield different vocabulary gains compared with other formats, suggesting

that digital modalities may differentially support specific reading components (Kaban & Karadeniz, 2021; Chen et al., 2018). Concerns about superficial engagement are echoed in research on deep processing and memory, which highlights a focus on central ideas rather than surface features in digital reading (Yeari & Lantin, 2020; Kaban & Karadeniz, 2021), as well as in studies stressing the role of self-determination and affect in sustaining use (Chen et al., 2018; Li & Chu, 2020). Mixed methods studies similarly point to broader motivational and behavioral effects of gamified pedagogy (Li & Chu, 2020; Grasparil & Hernandez, 2015). The effects of morphological awareness interventions in gamified settings further suggest their importance for understanding comprehension processes (Qiao et al., 2022; Yeari & Lantin, 2020). Taken together, these findings indicate that evidence remains limited concerning which specific reading components are most responsive to gamified approaches and how usage patterns relate to gains.

This study positions itself within that gap by focusing on a small scale, mixed method examination of gamified educational apps used for reading in a home school context. It offers a close look at two home schooled children aged ten and eleven who engaged with selected gamified apps over a defined period, while their reading comprehension was assessed before and after the intervention. The study not only tracks overall comprehension but also examines subscores for vocabulary, literal, and inferential understanding, and draws on interview data with children and parents to interpret the observed changes. In doing so, it contributes a nuanced, empirically grounded account of how gamified reading tools function in real home learning conditions rather than in tightly controlled classroom trials. More specifically, the study adopts an in depth, small scale mixed methods case study design involving two learners, allowing the research to examine learning processes, engagement patterns, and contextual factors in detail rather than aiming for statistical generalization. This design provides a qualitative dominant perspective in which descriptive score changes are interpreted alongside children's experiences and parental observations to better understand how gamified reading practices unfold in everyday home learning environments.

The significance of this work lies in its potential to inform parents, educators, and designers who are seeking evidence based

guidance on the role of gamified apps in supporting reading comprehension for home schooled learners. The study is guided by three research questions: first, to what extent does the use of gamified educational apps improve the overall reading comprehension of home schooled children aged ten to eleven; second, how does the use of such apps affect specific components of reading comprehension, namely vocabulary, literal comprehension, and inferential comprehension; and third, how do patterns of app use and children's reported learning experiences help explain the observed changes in reading comprehension scores. By addressing these questions through a qualitative dominant mixed methods case study of two learners, the study aims to generate detailed exploratory insights into reading development in home based education rather than broad generalizable claims about effectiveness.

The article concludes by highlighting the implications of the findings for English language teaching and learning, particularly in contexts where home based or blended arrangements are becoming more common. It argues that gamified educational apps can offer meaningful support for reading comprehension when they are integrated thoughtfully into broader literacy practices and complemented by parental or teacher scaffolding. At the same time, it cautions that digital tools are not a simple solution and must be aligned with clear reading goals, careful task design, and opportunities for learners to reflect on meaning rather than merely accumulate points or rewards. These insights are relevant not only for home schooled learners but also for ELT practitioners who are increasingly expected to integrate digital and gamified resources into their pedagogical repertoire in ways that genuinely enhance comprehension and critical engagement with texts.

METHOD

This study adopted a mixed method design that integrated quantitative and qualitative procedures to provide a comprehensive account of how gamified educational apps influence reading comprehension in a home school context. More specifically, the study employed a qualitative dominant, concurrent mixed methods case study design. In this design, qualitative data served as the primary source of insight for understanding learning processes and experiences, while quantitative pre-test and post-test scores functioned as descriptive and illustrative

indicators of change rather than as a basis for statistical inference. The quantitative strand consisted of pretest and posttest administration of a reading comprehension test to capture changes in learners' performance over a four week intervention. The qualitative strand drew on semi structured interviews with the children and their parents to explore lived experiences, perceived changes, and contextual factors that might help explain the test results. This combination was selected to balance objective measurement of learning outcomes with an in depth understanding of how and why those outcomes emerged, in line with recommendations for mixed method research in educational technology.

The participants were two home schooled children, one boy aged eleven and one girl aged ten, who were receiving their primary education at home under the supervision of their parents. Both families followed a structured home schooling routine that combined parent guided lessons with independent learning activities. The study was conducted entirely in the children's homes, which served as their main learning environment and the primary site for app use.

A purposive, criterion based sampling technique was employed to recruit participants. The researcher intentionally selected home schooled children who met three key criteria. First, they were in the late primary age range, ten to eleven years old, when reading comprehension skills become central for learning across subjects. Second, their parents were already integrating digital tools into daily learning and were willing to support regular use of the selected gamified apps during the intervention. Third, both children and parents agreed to participate in testing and interviews. Given the exploratory nature of the study, the recruitment of two participants is more appropriately understood as a small scale case based sample rather than a sample intended for statistical representation. The aim of this selection was therefore to enable an in depth examination of learning processes within authentic home schooling contexts rather than to generate generalizable findings across a larger population.

The main quantitative instrument was a reading comprehension test administered at two points, before the intervention as a pre-test and after four weeks of app use as a posttest. The test generated an overall comprehension score and included items that tapped three key components of reading comprehension. Vocabulary items assessed learners' understanding and application of target words. Literal comprehension items

required learners to identify explicitly stated information in short passages, whereas inferential items evaluated the ability to deduce implied meanings and connect ideas within and across sentences. Scores were summed to produce an overall total and three subscale scores for vocabulary, literal comprehension, and inferential comprehension.

The reading comprehension instrument was adapted from standardized upper primary reading assessment materials commonly used in English language literacy instruction. The passages and items were aligned with age appropriate reading levels and were piloted with a small group of learners of similar age to ensure clarity of instructions and appropriate difficulty. The instrument included balanced items across the three targeted comprehension components and followed established principles of reading assessment design (Grabe, 2009). While the small sample size of the present study limits statistical validation procedures, the instrument was used primarily to provide descriptive indicators of individual change over time rather than precise psychometric measurement. Potential practice effects resulting from repeated administration of the same test were therefore acknowledged as a methodological limitation and considered cautiously when interpreting score changes.

To support the qualitative strand, semi structured interview guides were developed for use with parents and children. Parent interviews focused on app usability, patterns of use, perceived effects on reading skills, and challenges encountered during app use. Child interviews explored enjoyment, motivation, perceived difficulty, favourite features, and perceived changes in reading. The flexible structure of the interviews allowed participants to elaborate on their experiences while ensuring that core topics were consistently covered.

The gamified educational apps used in the intervention were selected through a set of pedagogical and practical criteria. First, each app was required to include substantial reading activities in English, not only isolated phonics drills or spelling games, so that learners engaged with meaningful texts that could contribute to comprehension. Second, the language level and visual design had to be appropriate for children aged ten to eleven, with clear instructions, age suitable topics, and manageable text length. Third, the apps needed to incorporate core game elements such as levels, points, stars, or badges, along with immediate feedback on responses, so

that the activities could be considered genuinely gamified rather than merely digital worksheets. Fourth, the apps had to be accessible on the devices already available in the homes and either free or low cost, so that the intervention reflected realistic conditions for home schooling families. Fifth, the apps were preferred if they offered some indication of progress, for example levels completed or units finished, which could help parents monitor use informally.

Based on these criteria, the intervention primarily involved reading activities available in the applications Lingokids, Read Along by Google, and Duolingo Stories, which include short narrative passages, vocabulary tasks, and comprehension questions embedded within gamified progression systems. These applications incorporate mini game formats such as word matching, vocabulary selection, and text based question answering, allowing learners to interact repeatedly with written content while receiving immediate feedback and rewards. Naming the specific applications used in the intervention helps clarify the pedagogical features that formed the active elements of the learning experience and supports future replication of the study.

The study followed three main phases, pre intervention, intervention, and post intervention. In the pre intervention phase, the researcher administered the reading comprehension test individually to each child in a quiet space at home, following standardised instructions.

In the intervention phase, the children engaged with the selected gamified educational apps for four consecutive weeks. To ensure a consistent level of exposure, children were asked to use the apps for approximately thirty minutes per session, four times per week, focusing primarily on reading based activities such as story levels and comprehension tasks. The apps were integrated into the children's regular learning schedule several times per week, typically within literacy sessions. Parents were provided with brief guidelines encouraging them to prioritise reading oriented tasks within the apps, remind children to complete story based activities before exploring other features, and offer assistance when comprehension difficulties arose. However, parents were not instructed to follow a strict teaching script, allowing natural variations in scaffolding practices to emerge during the intervention.

In the post intervention phase, the same reading comprehension test was administered under similar conditions to ensure comparability

of scores. Shortly afterwards, semi structured interviews were conducted with each child and at least one parent. All interviews were audio recorded with permission and then transcribed verbatim for analysis. This sequencing allowed the researcher to gather quantitative indicators of change and, at the same time, capture fresh reflections on the experience of using the apps and on any perceived changes in reading.

Quantitative data analysis focused on describing changes in reading comprehension from pretest to posttest. Test scores were entered into a spreadsheet and examined using descriptive statistics. For each child, the researcher calculated pre and post means for overall comprehension and for each of the three subscales, along with absolute gain scores and percentage improvement. Given the very small sample size, the emphasis was on effect description rather than on formal inferential statistics, with patterns of improvement presented through tables and narrative comparison.

Qualitative data from child and parent interviews were analysed using thematic analysis. Transcripts were read several times to gain a holistic sense of the data, then coded line by line for references to usability, engagement, perceived learning gains, difficulties, parental support, and routines surrounding app use. Codes were refined and grouped into broader themes such as increased time on reading tasks, enjoyment of level based challenges, reliance on visual support, distraction by non-reading elements, and the importance of parental guidance for more complex texts.

In the final stage, the quantitative and qualitative findings were integrated to address the three research questions. In line with the qualitative dominant design of the study, thematic insights from interviews and observations were treated as the primary source of interpretation, while the descriptive score changes from the reading tests were used as triangulation points that helped illustrate patterns identified in the qualitative data. The researcher examined how patterns in the test score data corresponded with thematic patterns in the interview data in order to construct coherent explanations of how gamified app use appeared to influence reading outcomes.

Ethical procedures were carefully observed in line with guidelines for research involving children. Written informed consent was obtained from parents, and verbal assent was sought from the children before data collection began. Participants were informed that their involvement

was voluntary and that they could withdraw at any point without any negative consequences. Pseudonyms were used in transcripts and reporting to protect participants' identities, and all digital files were stored securely.

Given the very small number of participants, particular care was taken to avoid portraying one child as more successful or capable than the other. The use of pseudonyms such as Child A and Child B was intended solely to organise the presentation of data rather than to rank performance. During interviews and testing sessions, the researcher emphasized that the activities were part of an exploratory study rather than an evaluation of the children's abilities. This approach was adopted to ensure that participants did not experience the research process as judgmental or evaluative.

All activities, including app use, testing, and interviews, were designed to be age appropriate and to take place in a familiar environment so that participation aligned with the educational interests and well-being of the families.

RESULTS AND DISCUSSION

Overall changes in reading comprehension

Analysis of the pretest and posttest scores showed an observable increase in the overall reading comprehension scores of the two participating children after four weeks of engagement with gamified reading applications. Each child obtained a higher total score in the posttest compared with the pretest, which indicates descriptive changes in their performance on the reading comprehension tasks rather than statistically generalizable improvement. As summarised in Table 1, Child A's score increased from 55 to 78, while Child B's score rose from 60 to 70. On average, the two children moved from a mean pretest score of 57.5 to a mean posttest score of 74.0, which represents an average gain of 16.5 points or roughly a twenty nine percent increase in overall reading performance. These figures document individual score changes observed during the intervention period rather than population level effects. Although the size of improvement was larger for Child A, the direction of change was consistently positive for both participants.

Table 1. *Overall pretest and posttest reading comprehension scores*

Participant	Pretest score	Posttest score	Gain (points)	Gain (percent)
Child A	55	78	23	41.8
Child B	60	70	10	16.7
Mean	57.5	74.0	16.5	28.7

The numerical pattern in Table 1 is accompanied by observable differences in how the children approached the test tasks across the two testing sessions. In the pretest, both children showed hesitant behaviour, including long pauses before answering, frequent re reading of the same sentences, and a tendency to leave items blank when unsure. By the time of the posttest, completion was noticeably faster and more confident. The proportion of skipped items dropped from about fifteen percent of the total questions in the pretest to less than five percent in the posttest, and both children attempted almost all items even when they were not fully certain. These behavioural observations suggest increased familiarity with text based tasks and test procedures rather than serving as direct evidence of generalized reading development.

A closer look at item level performance further illustrates this shift. In the pretest, correct answers clustered on shorter and more concrete questions, while performance on longer or more inferential items was inconsistent. In the posttest, both children were able to maintain higher accuracy across the entire test, including items that required

combining several pieces of information from the text. The distribution of scores became more even, with fewer very low item scores and a larger proportion of items answered correctly by both participants. Figure 1 can be used to present this change visually by plotting each child's total score in the pretest and posttest, which would show two clear upward bars for both participants. Figure 1 illustrates these descriptive score differences by presenting each child's pretest and posttest totals in a simple bar chart.

These quantitative results align with observational notes taken during the testing sessions. In the pretest, the children frequently asked for clarification about instructions and sometimes appeared disengaged after encountering difficult questions. In the posttest, they showed more persistence, checked their answers more carefully, and were willing to return to earlier items to revise responses. The researcher noted fewer signs of frustration and more self correction, which may reflect increased confidence in interacting with text based tasks during the study period.

The test findings were triangulated with information from interviews with parents and children. Both parents reported that their children became more willing to engage in reading tasks during the intervention, especially those embedded within the gamified apps. The children described reading activities in the apps as more enjoyable and less tiring compared with traditional worksheets. Parents also observed that their children increasingly tried to read on screen prompts independently before asking for help.

Taken together, the convergence of numerical gains, behavioural indicators, and interview narratives offers a descriptive account of how the two children interacted with reading tasks during the intervention period. These results should therefore be interpreted as context specific observations of individual learning experiences rather than as generalizable evidence about the effectiveness of gamified reading applications.

Component scores for vocabulary, literal, and inferential comprehension

A closer look at the component scores revealed a differentiated pattern of gains across vocabulary, literal comprehension, and inferential comprehension. As shown in Table 2, both

children recorded the largest numerical and proportional gains in vocabulary, followed by moderate gains in literal comprehension and more modest gains in inferential comprehension.

For vocabulary, Child A's score increased from 52 to 80, while Child B's score rose from 55 to 68. On average, vocabulary scores improved by 20.5 points across the two participants. These figures represent descriptive gains observed in the test scores and should be interpreted as individual changes rather than as evidence that the applications systematically improve vocabulary learning.

Literal comprehension scores also improved for both participants, although the gains were slightly smaller than those for vocabulary. Child A's literal score increased from 58 to 82, while Child B's score rose from 62 to 74. These results suggest that both children showed higher accuracy in identifying explicitly stated information in the passages during the posttest session.

In contrast, inferential comprehension showed smaller changes. Child A moved from 50 to 72 and Child B from 50 to 60. Although the scores increased, inferential items remained comparatively more challenging for both participants in the posttest.

Table 2. *Pretest and posttest component scores for reading comprehension*

Component	Participant	Pretest	Posttest	Gain (points)	Gain (percent)
Vocabulary	Child A	52	80	28	53.8
	Child B	55	68	13	23.6
	Mean	53.5	74.0	20.5	38.3
Literal	Child A	58	82	24	41.4
	Child B	62	74	12	19.4
	Mean	60.0	78.0	18.0	30.0
Inferential	Child A	50	72	22	44.0
	Child B	50	60	10	20.0
	Mean	50.0	66.0	16.0	32.0

Figure 2 illustrates these component level differences through a clustered bar chart displaying pretest and posttest scores for each component.

When interpreted through the lens of the Simple View of Reading, this pattern is consistent with the idea that vocabulary knowledge and literal comprehension represent foundational aspects of linguistic comprehension, while inferential comprehension involves more complex integration processes that require readers to combine textual information with prior knowledge and contextual reasoning. Such integrative processes are cognitively more demanding and may not be easily strengthened

through short cycles of repetitive digital practice alone.

Interview data provide further context for these patterns. Children frequently described interacting with activities that required them to match words with meanings, select appropriate vocabulary options, or answer short comprehension questions embedded in stories. These repeated encounters with words and text segments appear to have increased exposure to lexical items and explicit textual information.

Parents also reported that the children began noticing unfamiliar words during reading activities and occasionally asked questions about their meanings. Such observations suggest that the apps created opportunities for repeated

engagement with vocabulary and literal information, although the study design does not allow causal claims about instructional effectiveness.

Inferential comprehension presented a different pattern. Both children described inferential questions as “hard guessing questions,” particularly when the answers were not explicitly stated in the passage. Parents observed that the children often searched for sentences that directly contained the answer and became uncertain when interpretation was required.

This pattern aligns with reading comprehension theory suggesting that inferential reasoning involves higher level cognitive integration processes that require active reflection, dialogue, and strategic reasoning beyond simple recognition tasks. Digital reading activities that rely primarily on point and click responses may therefore provide limited support for the development of these deeper interpretive

processes unless they are complemented by guided discussion.

Patterns of app use, learning experiences, and explanation of score changes

To address the third research question, patterns of app use and learners’ experiences were examined in relation to the quantitative gains in reading comprehension. Usage logs and parental notes indicated that both children engaged with the gamified apps several times per week, but the focus of their activity diverged. Child A used the apps more consistently for reading based activities, while Child B divided attention between reading tasks and non-reading features. These differences in engagement patterns provide contextual insight into how the children interacted with the apps during the intervention period. Table 3 summarises key indicators of app use during the four weeks intervention.

Table 3. Patterns of app use during the four weeks intervention

Indicator	Child A	Child B
Average sessions per week	4	4
Average duration per session (minutes)	25	20
Estimated proportion of time on reading tasks (%)	70	50
Estimated proportion of time on non reading features (%)	30	50
Total estimated reading time (minutes, 4 weeks)	280	160

When these usage data are considered alongside the descriptive test scores, an illustrative pattern can be observed. Child A, who accumulated around 280 minutes of reading focused activity, recorded larger descriptive score increases in overall comprehension, vocabulary, and literal understanding than Child B, whose estimated reading time was about 160 minutes. Given the extremely small sample size, this pattern should not be interpreted as a statistical

relationship between exposure and learning outcomes, but rather as a contextual observation that helps interpret how engagement with reading tasks differed between the two learners.

Table 4 presents selected excerpts alongside their primary qualitative codes. Tags at the end of each excerpt indicate speaker, interview sequence, and approximate time stamp, signalling the qualitative nature and traceability of the data.

Table 4. Selected interview excerpts and qualitative codes

Speaker	Excerpt	Primary Code(s)
Child A	“I like finishing the story levels and seeing my stars go up. If I do not understand a part, I read it again because I want to get three stars, not just one.” [Child A_Int1_12:05–12:26]	Reading-oriented engagement; Goal-driven rereading; Meaning-focused use of rewards
Child B	“Sometimes I do the reading questions, but I also like changing my character’s clothes and collecting stickers. If the story is too long, I just play the easy questions to get points.” [Child B_Int1_07:41–08:02]	Reward-driven behaviour; Surface engagement; Task avoidance for longer texts
Parent A	“We agreed that when the reading app is open, it is reading time. I sit beside him at the beginning, remind him to finish the story level first, then he can explore other features. If he gets stuck on a question, we read the sentence together and think about it.” [Parent A_Int1_03:10–03:45]	Parental structuring of use; On-task redirection; Scaffolding comprehension strategies

Parent B	“At first she just wanted to dress up the avatar and tap random answers. I sometimes reminded her to finish the reading level, but I could not always sit next to her. When I was busy, she mostly played the easy parts, not the longer stories.” [Parent B_Int1_05:22–05:54]	Inconsistent scaffolding; Distraction by cosmetic features; Preference for low-effort tasks
Child A	“The hardest questions are when the answer is not written in the story. I have to think, and sometimes I ask my mum, ‘Why did he do that?’” [Child A_Int2_09:03–09:21]	Inferential difficulty; Help-seeking; Emerging metacognitive awareness
Parent A	“For the why questions, I ask him to look for clues in the text and relate them to what we know. Without that talk, he tends to choose the first answer that looks correct.” [Parent A_Int2_04:47–05:06]	Guided inferencing; Text-to-self linking; Prevention of guessing

The coded excerpts clarify how usage patterns and adult mediation shaped the children’s learning experiences during the intervention. Child A’s statement, tagged [Child A_Int1_12:05–12:26], illustrates reading oriented engagement, goal driven rereading, and meaning focused use of rewards. Stars and levels appear to function as incentives for rereading and attempting to understand story content rather than simply completing tasks quickly. This description aligns with the higher proportion of time Child A spent on reading based activities (70 percent), although the relationship should be interpreted descriptively rather than causally.

In contrast, Child B’s excerpt, tagged [Child B_Int1_07:41–08:02], illustrates reward driven behaviour, surface engagement, and occasional avoidance of longer reading tasks. This pattern aligns with the lower proportion of reading focused activity reported in Table 3 and the more modest score changes observed for this participant.

Parental accounts provide a second layer of triangulation. Parent A’s description, tagged [Parent A_Int1_03:10–03:45], highlights parental structuring of use, on task redirection, and scaffolding of comprehension strategies. App sessions were framed as “reading time,” and completion of story levels was prioritised before other features were explored. Such structuring appears to have supported sustained engagement with textual content during the sessions.

Parent B’s narrative, tagged [Parent B_Int1_05:22–05:54], reflects more intermittent guidance and the presence of distractions within the app environment. When adult support was less consistent, the child sometimes gravitated toward cosmetic or low effort features, such as avatar customisation or short tasks.

The excerpts focusing on inferential comprehension highlight the particular importance of adult support for higher order reading processes. Child A’s comment, tagged [Child A_Int2_09:03–09:21], indicates awareness that some questions required reasoning beyond

what was explicitly written in the story. Parent A’s explanation, tagged [Parent A_Int2_04:47–05:06], describes guiding the child to search for textual clues and relate them to prior knowledge.

These excerpts suggest that inferential comprehension often required dialogic interaction between parent and child, rather than independent completion of app tasks alone.

Taken together, triangulation across descriptive score changes, usage indicators, and qualitative excerpts provides a richer understanding of how the intervention unfolded. Rather than demonstrating a direct causal relationship between app usage time and reading improvement, the data illustrate how patterns of engagement, parental scaffolding, and task design interacted within the learning environment.

Qualitative analysis of the interview excerpts suggests three recurring themes:

Game features can support reading engagement when rewards encourage rereading and attention to story meaning [Child A_Int1_12:05–12:26].

The same features can distract learners when they emphasise cosmetic or low effort activities [Child B_Int1_07:41–08:02]; [Parent B_Int1_05:22–05:54].

Parental scaffolding plays an important role in guiding learners toward deeper comprehension processes, particularly for inferential questions [Parent A_Int1_03:10–03:45]; [Child A_Int2_09:03–09:21]; [Parent A_Int2_04:47–05:06].

In sum, sustained engagement with gamified educational apps appears to coincide with positive reading experiences for the two participants in this study. However, the findings should be understood as contextual insights into how these particular learners interacted with the digital reading environment rather than as general evidence of effectiveness.

The analysis suggests that three conditions were particularly visible in the observed learning routines. First, a larger proportion of session time was devoted to text based activities rather than

peripheral features. Second, game rewards were interpreted as incentives for understanding story content rather than merely collecting points. Third, parental guidance helped maintain focus on reading tasks and supported inferential reasoning when questions required interpretation beyond explicitly stated information.

These process oriented observations highlight that gamified reading tools may function most productively when embedded within guided literacy routines that combine digital interaction with discussion, questioning, and reflection on text meaning.

The findings of this mixed method study document how two home schooled children interacted with gamified reading applications during a four week learning period. Both participants improved their overall scores from pretest to posttest, with an average increase of 16.5 points. Because the study involved only two learners, these numerical differences should be interpreted as descriptive changes within individual cases rather than as generalisable evidence of learning effects. Rather than aiming to compare the two children against each other, the study uses their trajectories as parallel, illustrative cases to examine *how* gamified features, patterns of use, and parental scaffolding interact to support or constrain comprehension development in a home schooling context.

At the component level, the most visible pattern in the data was the relatively larger descriptive change in vocabulary scores. This observation is broadly consistent with research suggesting that repeated encounters with words in engaging contexts can support lexical development in digital learning environments (Hamari et al., 2014; McNamara et al., 2016). In the apps described earlier in the Method section, many activities required learners to select correct word meanings, match vocabulary with visual cues, or identify appropriate lexical items within short reading passages. These activities created repeated opportunities to encounter the same words across multiple levels. Parents reported that some vocabulary items introduced through the apps later appeared in everyday conversations, suggesting that lexical learning extended beyond the immediate game context.

Literal comprehension also showed noticeable descriptive increases for both children. This pattern aligns with earlier studies linking gamified learning environments with increased time on task and repeated interaction with textual information (Huang & Soman, 2013; Reading et al., 2020).

Many reading levels required learners to locate explicitly stated details in short passages before progressing to the next stage of the activity. Over time, both children appeared to develop more systematic habits of rereading passages and checking textual details before selecting answers. Parents noted that these strategies began to appear during other reading activities outside the apps as well. These observations suggest that the structured progression of reading levels may have encouraged careful attention to textual information, although the study design does not allow causal claims about instructional effectiveness.

In contrast, inferential comprehension remained the most challenging component for both participants. Although both children recorded higher inferential scores in the posttest, interview responses indicated that questions requiring interpretation beyond explicitly stated information were still perceived as difficult. This observation resonates with studies suggesting that game mechanics alone may not automatically support higher order comprehension processes (Kapp, 2012; Van Roy & Zaman, 2019). From the perspective of reading comprehension theory, including the Simple View of Reading discussed earlier, inferential reasoning requires integrating textual information with background knowledge and contextual interpretation. Such processes often depend on dialogue, explanation, and strategic reasoning that extend beyond recognition based digital tasks. When inferential questions appeared, the children frequently sought parental assistance or relied on discussion to clarify possible interpretations. These patterns suggest that digital reading activities may provide opportunities for practice with vocabulary and factual information, while deeper interpretive reasoning may require additional forms of guided interaction.

The qualitative data further highlight that the study is not intended to rank or compare the abilities of two individual learners, but rather to explore different ways of engaging with the same gamified learning environment. One child tended to approach reading levels as opportunities to understand the story and often reread passages in order to obtain higher scores within the reward system. The other child was sometimes more attracted to peripheral features of the app environment, such as avatar customisation or shorter tasks. These differences illustrate variation in engagement patterns rather than differences in learning ability. The analysis therefore focuses on

how learners navigated the gamified environment and how parental guidance influenced those interactions.

The findings also foreground the central role of parental scaffolding in mediating children's engagement with gamified reading tools. This observation echoes previous work emphasising the importance of guidance and dialogic interaction in technology mediated literacy learning (Ryan & Deci, 2000; Gee, 2003). Parents who framed the reading activities as opportunities to understand story content helped children connect game rewards with meaning making rather than simply collecting points. When inferential questions appeared, parents often encouraged learners to search for textual clues, relate events to prior knowledge, and explain their reasoning. Where such scaffolding was less consistent, the same digital features sometimes encouraged more superficial forms of engagement. These observations suggest that, in home schooling contexts, gamified apps may function most productively when embedded within guided literacy routines rather than used as independent learning tools.

Taken together, the study contributes a process oriented perspective to the literature on gamified reading in non-formal learning environments. Earlier studies have reported that gamification can increase motivation, time on task, and vocabulary exposure (Hamari et al., 2014; Reinders & Wattana, 2015). The present study complements this literature by illustrating how patterns of engagement, parental mediation, and task design interact within a home learning environment. The novelty of the study lies in its detailed integration of test score changes, usage patterns, and interview narratives within a small scale home schooling context that has received limited empirical attention (Ray, 2017; Yunus et al., 2020). Rather than treating quantitative scores and qualitative accounts as separate strands, the study examines how children's experiences with digital reading activities unfolded in everyday home learning routines.

For English language teaching and literacy support, several implications can be drawn from these observations. First, gamified educational apps that include structured vocabulary and text based activities may provide useful opportunities for repeated interaction with lexical items and factual information. Second, such tools should not be expected to independently support all dimensions of reading comprehension. Higher order processes such as inference making,

explanation, and interpretation may benefit from additional discussion based activities that encourage learners to articulate and justify their understanding of texts. Future research could extend this exploratory work by involving larger groups of learners, examining longer intervention periods, and investigating how different forms of parental or teacher scaffolding influence reading development in both home based and blended learning environments.

CONCLUSION

This study presents a small scale, in depth exploration of two home schooled children who engaged with gamified reading applications over a four weeks period, and the findings should therefore be interpreted as context specific insights rather than generalizable conclusions. Across the intervention period, both children showed descriptive differences between pretest and posttest reading comprehension scores, with the largest changes observed in vocabulary and literal comprehension, while inferential comprehension remained comparatively more challenging. These patterns suggest that repeated engagement with vocabulary and text based activities in gamified environments may support certain foundational aspects of reading practice, although higher order comprehension processes appear to require additional dialogue and guided reasoning beyond what the apps provide by default. The novelty of this study lies in its fine grained mixed method examination of how two learners interacted with the same gamified environment in a home schooling context, illustrating how patterns of engagement and parental scaffolding shaped their reading experiences rather than positioning the apps as independently effective learning tools. From a practical perspective, the findings indicate that gamified educational apps may serve as useful tools for supporting home based literacy when their use is intentional, text focused, and accompanied by active parental guidance that encourages learners to interpret, explain, and connect ideas within texts. Given the very small sample and the context bound nature of the study, future research should extend this work through larger samples, longer intervention periods, and comparative investigations across contexts such as mainstream schools, bilingual programmes, and inclusive classrooms, while also exploring app designs and pedagogical strategies that more directly support inferential and critical reading development in English language learning.

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Gamified educational apps and reading comprehension in home-schooled children: An exploratory mixed-methods case study