

Gamification In Education: Iterative Development Of Reading Bingo Quest To Support Students' Reading Habits

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Abstract

Reading habits among students require learning environments that are engaging, structured, and responsive to their interests. Existing research has examined gamified reading and printed Reading Bingo separately, leaving a gap in digital platforms that integrate reading challenges, gamification, reflection, and progress monitoring. This study aimed to develop and examine the use of Reading Bingo Quest (RBQ), a gamification-based digital platform designed to support students' reading habits. The study employed Educational Design Research (EDR) through three phases: analysis and exploration, design and construction, and evaluation and reflection. The evaluation involved two iterative cycles, with data collected using a 4-point Likert-scale questionnaire and analyzed descriptively across usability, user experience, motivation and engagement, and reading-habit support. The findings indicated positive student responses in both cycles, with the overall mean increasing from 3.72 in Cycle 1 to 3.80 in Cycle 2 and improvements across all evaluated aspects. Iterative refinement of RBQ's reading challenges and gamification features was accompanied by more positive responses in the second cycle. These findings highlight the potential of gamification-based digital media to create an engaging and structured environment for supporting students' reading habits and demonstrate the value of iterative EDR in developing digital learning media.

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Keywords: Gamification; Reading Habits; Reading Bingo Quest; Digital Platform; Educational Design Research

INTRODUCTION

Reading habits constitute an important foundation for literacy development and higher-order thinking among students. Regular engagement with reading provides opportunities for students to analyze, reason, evaluate, and communicate information, while also supporting the development of lifelong learning dispositions (Govorova et al., 2023; OECD, 2023). Strong reading habits are also associated with students' ability to interpret, evaluate, and draw conclusions from diverse texts (Abid et al., 2023; Agustina et al., 2024). Therefore, fostering consistent reading habits during the middle-school years is an important concern in literacy development.

However, establishing reading habits remains challenging in practice. Students may show limited motivation and engagement when reading is perceived as repetitive, monotonous, or disconnected from their interests (Al-Hafdi & Alhalafawy, 2024). Reading habit formation therefore cannot rely solely on routine assignments or administrative reading records; it requires learning environments that offer meaningful activities, choice, continuous feedback, and forms of engagement relevant to students' interests.

One approach used to encourage reading activities is Reading Bingo, an adaptation of the conventional reading log that organizes reading activities into varied challenges. By presenting different reading tasks, Reading Bingo can encourage students to engage with diverse types of texts and reading contexts (O'Day, 2025; Vázquez et al., 2021). The bingo format has also been used as an instructional tool beyond reading: in a medical course, students perceived bingo-based activities as engaging, and their post-test scores were higher than their pre-test scores (Sannathimmappa et al., 2024). Nevertheless, its printed form has practical limitations. Manual recording can make monitoring and feedback less efficient, while the limited space in printed logs restricts students' opportunities to document summaries, reflections, and their understanding of the texts they read (O'Day, 2025). These limitations create an opportunity to transform Reading Bingo into a digital environment that facilitates tracking, reflection, progress monitoring, and feedback.

Digital gamification offers a potential approach to these challenges. Previous studies have shown that gamification can support students' motivation and engagement by incorporating game-related elements into learning activities (Al-Hafdi & Alhalafawy, 2024). In reading-related



contexts, gamified digital environments have been associated with increased engagement, motivation, and aspects of reading performance and comprehension (Al Ali et al., 2024; Li & Chu, 2021). Elements such as points, rewards, leaderboards, badges, levels, and progress indicators have been used in educational environments to encourage participation (Dah et al., 2023; Funa et al., 2021). However, gamification does not automatically ensure meaningful engagement, as its value depends on how game elements are integrated with learning activities and aligned with students' characteristics and interests (Al-Hafdi & Alhalafawy, 2024; Moyano-Barahona et al., 2025). The design challenge is therefore not simply to add game elements to reading activities, but to integrate them into structured reading experiences that offer manageable challenges and opportunities for students to monitor and reflect on their reading.

Despite the growing use of digital media and gamification in reading-related learning, a gap remains in the development of digital platforms that integrate reading challenges, reading records, reflection, and progress monitoring as interconnected components of a gamified reading environment. Existing studies have examined gamification in relation to reading comprehension, motivation, and engagement, and Reading Bingo has offered a more varied way to organize reading activities, but neither necessarily provides such an integrated environment. A systematic review of gamified reading instruction found that the largest share of the reviewed studies were conducted in primary schools and that just over half did not adopt an explicit theoretical framework (Wang et al., 2024), which suggests that secondary school contexts and theory-informed designs remain less explored. Such a platform also needs to be refined iteratively based on users' responses so that its features and activities suit students' reading interests and experiences.

To address this need, Reading Bingo Quest (RBQ) was developed as a gamification-based digital platform that transforms the conventional Reading Bingo approach into an interactive reading environment. Unlike bingo games used primarily for vocabulary or listening activities (Oktaviani et al., 2024; Pranata Perangin-Angin et al., 2022), RBQ focuses on supporting reading habits through varied and challenging reading activities. It integrates reading challenges, points, badges, a leaderboard, reading logs, reflection activities, and progress tracking, extending the conventional reading log by allowing students to record, reflect on, and monitor their reading within a single platform. Because it brings structured reading activities, gamified engagement, and reflective practice together, RBQ is a suitable object for iterative development and evaluation.



Accordingly, this study aimed to develop and evaluate RBQ as a gamification-based digital platform for supporting students' reading habits. The study employed Educational Design Research (EDR), which emphasizes iterative development through cycles of design, implementation, evaluation, and reflection (McKenney & Reeves, 2018; Najib Awang Mohamad, 2025). Two iterative evaluation cycles examined students' responses to the platform and informed the refinement of its reading challenges and gamification features.

Specifically, this study addressed two research questions: (1) How was RBQ designed and validated to integrate reading challenges, gamification, reading documentation, reflection, and progress monitoring based on the needs of the partner school? (2) How did students respond to RBQ in terms of usability, user experience, motivation and engagement, and perceived support for reading habits across two evaluation cycles, and how was the platform refined based on their feedback? The novelty of this study lies in a design-based account of a gamified Reading Bingo platform that combines these components within a single environment, supported by students' responses across two refinement cycles.

LITERATURE REVIEW

This section reviews recent scholarly work on reading habits, gamification in reading-related learning, the evaluation of digital gamified media, and Educational Design Research, and then states the research position of the present study.

Reading Habits as a Multidimensional Construct

Reading habits among secondary school students have been examined empirically (Abid et al., 2023; Agustina et al., 2024; Vázquez et al., 2021), and their conceptualization extends beyond reading frequency. The Self-Report Habit Index for Reading (SRHI-R), adapted from a general habit index, conceptualizes reading habit as a construct involving repeated behavior, automaticity, and the expression of one's identity (Schmidt & Retelsdorf, 2016). Complementing this perspective, the Reading Habits Inventory (RHI) describes reading habits through dimensions related to perceptions of reading, general reading practices, reading purposes, reading-related activities, and the use of technology for reading (Senthilkumaran & Revathi, 2022). Together, these perspectives provide a conceptual basis for attending to reading engagement, variation in reading activities, reading purposes, and students' awareness of their reading practices;



accordingly, the development and evaluation of RBQ treat reading habits as a multidimensional construct.

Gamification and Reading-Related Learning

Studies of gamified reading have examined outcomes such as creative reading skills (Al Ali et al., 2024), reading comprehension (Moyano-Barahona et al., 2025; Nitiasih et al., 2022), and reading engagement (Matyakhan et al., 2024) across primary, secondary, and university levels. Li and Chu (2021) examined children's reading-related mentality and behaviors. More broadly, research on gamification in learning has discussed how intrinsic motivation and extrinsic rewards can be balanced (Dah et al., 2023; Funa et al., 2021). Reading Bingo, in contrast, has been described mainly as an adaptation of the conventional reading log (O'Day, 2025). The two strands have therefore developed largely in parallel.

Evaluating Digital Gamified Learning Media

Because RBQ is a digital platform incorporating gamification, its evaluation requires attention to both platform quality and users' experiences with its gamified features. The Mobile Application Rating Scale (MARS) provides a multidimensional framework for considering digital application quality through engagement, functionality, aesthetics, and information quality (Terhorst et al., 2020). Meanwhile, the Gameful Experience Scale in Education (EGAMEDU) provides an education-oriented framework for examining experiences associated with gamification, including fun, attention, creative thinking, absence of negative effects, socialization, and learning (Parra-González et al., 2022). Together, these frameworks provide a basis for considering the quality and user experience of gamified reading media, particularly in relation to usability, engagement, visual and functional aspects, and students' perceived support for reading activities.

Educational Design Research in Developing Digital Learning Media

EDR connects the development of an educational intervention with systematic evaluation and reflection in authentic contexts (McKenney & Reeves, 2018; Najib Awang Mohamad, 2025). This makes it suitable for developing digital learning media whose features need to be refined based on users' responses.



Research Position of the Present Study

Taken together, this literature positions the present study as a development and evaluation study that brings together gamified reading activities, a multidimensional view of reading habits, and the evaluation of both application quality and gameful experience in one platform, refined iteratively through EDR.

METHODS

Research Approach

This study employed EDR, an approach that connects the development of an educational intervention with systematic evaluation and reflection in an authentic context through iterative of design, implementation, evaluation, and reflection (McKenney & Reeves, 2018; Najib Awang Mohamad, 2025). The study focused on the design of RBQ and on students' responses to it across two evaluation cycles, with each cycle informing the refinement of the platform.

Types and Sources of Data

Two types of data were collected. Qualitative data consisted of observation notes, interview data, and feedback obtained from experts and students during the development and evaluation process. Quantitative data consisted of expert validation scores and students' questionnaire responses on a four-point scale. The data sources were the partner junior secondary school, three experts who validated the RBQ prototype (an educational technology lecturer, a language teacher, and the school librarian), and 15 students from Grades 7–9 who used the platform.

Participants and Sampling Technique

The study was conducted, with the school's permission, in a junior secondary school that had previously implemented a printed Reading Bingo program as part of its reading habit activities. The participants were 15 students from Grades 7–9, who were the primary users of RBQ, and one school librarian, who supported the implementation of the evaluation activities.

Participants were selected using purposive sampling based on the recommendation of the school librarian. The 15 students were student librarians involved in the school's library activities, and were therefore considered suitable to try the platform and provide informed feedback during its early development. This group size was considered appropriate for an early-stage



development study because it allowed close observation and rapid feedback for refining the prototype; the study did not aim at statistical generalization. The same 15 students participated in both evaluation cycles, which allowed the research team to examine their responses to the refined version of the platform within the iterative development process. The development process involved collaboration between the research team and school practitioners to identify implementation needs and refine the platform.

Research Instruments

Three instruments were used. First, observation and semi-structured interview guides were used with the school librarian to identify literacy needs and challenges associated with the existing printed Reading Bingo program. Second, an expert validation sheet with a four-point scale was used by the three experts to assess the RBQ prototype in four aspects: material quality, pedagogical quality, technical quality, and visual quality. Third, a structured student questionnaire consisting of 21 items rated on a four-point Likert scale (1 = strongly disagree to 4 = strongly agree) examined four aspects: usability (5 items), user experience (5 items), motivation and engagement (6 items), and perceived support for reading habits (5 items). The questionnaire also included three open-ended questions to capture students' feedback and suggestions for improving the platform. The same questionnaire was administered in both evaluation cycles so that responses could be compared.

The items were developed with reference to the conceptual perspectives underlying digital application quality, gameful experience, and reading habits, including the Mobile Application Rating Scale/MARS (Terhorst et al., 2020), the Gameful Experience Scale in Education/EGAMEDU (Parra-González et al., 2022), the Self-Report Habit Index for Reading/SRHI-R (Schmidt & Retelsdorf, 2016), and the Reading Habits Inventory/RHI (Senthilkumaran & Revathi, 2022). These instruments served as conceptual references rather than being administered in their original forms. The items on reading habits asked students how far RBQ supported their reading activities, and therefore measured perceived support rather than actual changes in reading behavior.

Data Collection Techniques

Data were collected in three phases. During the analysis and exploration phase (January–March 2026), observations and semi-structured interviews with the school librarian were



conducted to identify challenges in the existing reading activities, and the findings were used to establish the functional and pedagogical requirements of the digital platform. During the design and construction phase (April–May 2026), these requirements were translated into the RBQ prototype, which was validated by three experts using a four-point validation scale and refined before implementation. The evaluation and reflection phase comprised two cycles. In Cycle 1 (June–July 2026), students used the initial version of RBQ as a limited trial and completed the evaluation questionnaire; the responses, observations, and feedback were then reviewed to identify aspects requiring refinement. In Cycle 2 (July–August 2026), the refined version of RBQ was implemented, followed by the same questionnaire.

Theoretical Framework

The EDR framework adopted in this study was informed by the model proposed by McKenney and Reeves (2018), which organizes development as an iterative process rather than a linear sequence. The model, adapted in Figure 1, guided the development of RBQ from the identification of contextual needs to the evaluation of the refined platform. In addition, reading habits were treated as a multidimensional construct informed by the SRHI-R and the RHI, while the quality and user experience of the platform were considered through the MARS and EGAMEDU frameworks, as described in the Literature Review.

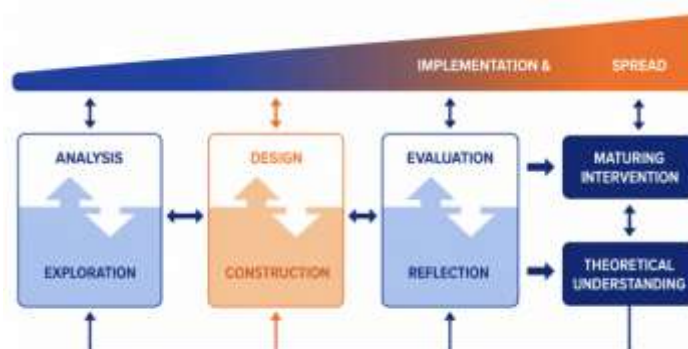


Figure 1. Educational Design Research Model.

Source: Adapted from McKenney and Reeves (2018).

As shown in Figure 1, the model consists of three interconnected phases: analysis and exploration, design and construction, and evaluation and reflection (McKenney & Reeves, 2018). The two-way arrows indicate feedback loops among the phases, so findings from one phase can

inform the others, while implementation accompanies all phases. Evaluation and reflection contribute to a maturing intervention and to theoretical understanding, which in turn feed back into the earlier phases. In this study, the phases corresponded to the needs analysis of the printed Reading Bingo program, the design and validation of the RBQ prototype, and two evaluation cycles that guided the refinement of the platform.

Data Analysis Techniques

Questionnaire data were analyzed descriptively by calculating the mean score for each evaluation aspect and the overall mean for each cycle, and expert validation scores were summarized as an overall mean across the four validated aspects. The mean scores were interpreted using four equal-width categories based on the four-point Likert scale (Salleh et al., 2026) : 1.00–1.75 (Very Low), 1.76–2.50 (Low), 2.51–3.25 (High), and 3.26–4.00 (Very High). The results of Cycle 1 and Cycle 2 were then compared descriptively to identify changes in students' responses following the refinement of RBQ. Observations and feedback were reviewed to provide contextual information for interpreting the questionnaire results.

Data Credibility

Data credibility was addressed through three strategies. First, content validity was established through expert judgment: the same three experts reviewed the RBQ prototype and the student questionnaire items for relevance, clarity, and suitability for junior secondary students before use. Second, data triangulation was applied by comparing the questionnaire results with observation notes, interview data, and students' open-ended feedback to check whether the findings were mutually consistent. Third, member checking was conducted with the school librarian, who reviewed the summary of the interview findings and the resulting platform requirements (presented in the Results) and confirmed that it reflected the conditions of the school's Reading Bingo program.

RESULTS

Development of Reading Bingo Quest

The development of RBQ began with an analysis of the school's existing printed Reading Bingo program, which identified several needs related to the management of reading activities. Student reading records were maintained manually, which made monitoring individual progress



relatively demanding for teachers and the school librarian. Some students perceived reading and recording activities as relatively administrative and less engaging. The program also provided limited opportunities for structured rewards and visible progress tracking.

These findings became the basis for the functional and pedagogical requirements of RBQ. The development was therefore not limited to transferring the printed Bingo format into a digital interface; the activity was redesigned to provide a more structured and interactive reading experience.

RBQ was developed with a digital Bingo board containing reading challenges organized according to different categories and levels of difficulty. Students can select and complete reading challenges as part of their reading activities. Completed challenges are connected with a point system that provides recognition of student progress. The platform also incorporates badges, a leaderboard, and progress indicators to make achievements and participation more visible. In addition, the reading log allows students to document their reading activities and provide brief reflections on the materials they have read.

The platform also provides supporting features, including Daily Challenge and Book Discussion, to introduce variation in reading activities. A teacher dashboard was developed to facilitate the monitoring of student participation and reading progress. Through the combination of these features, RBQ integrates student-facing reading activities with mechanisms for documentation, reflection, and monitoring within a single digital environment. The main interface and features of RBQ are presented in Figure 2.



Figure 2. Reading Bingo Quest Platform Interface

Figure 2 illustrates how the major components of RBQ are integrated within one digital environment. The Bingo board provides the main structure for reading challenges, while points, badges, and the leaderboard provide visible feedback on students' progress and achievements. The reading journal complements the gamification elements by providing a space for students to document and reflect on their reading activities.

Before implementation with students, the RBQ prototype was validated by the three experts using a four-point scale covering material, pedagogical, technical, and visual quality. It obtained an overall mean score of 3.65, indicating that the product was suitable for implementation with minor revisions.

The experts also gave formative feedback: several reading challenge instructions needed to be clearer so that students could understand the expected activities without ambiguity, the variety of reading challenges should be increased to broaden opportunities for participation, and visual presentation and responsiveness across screen sizes should be improved. This feedback was incorporated before the student evaluation and produced the initial version used in Cycle 1

Student Responses across Evaluation Cycles

The same 15 students evaluated RBQ in two cycles across four aspects: usability, user experience, motivation and engagement, and perceived support for reading habits. The results are presented in Table 1.

Table 1. Student Responses to Reading Bingo Quest Across Evaluation Cycles

Evaluation Aspect	Cycle 1	Cycle 2
Usability	3.77	3.86
User Experience	3.62	3.72
Motivation and engagement	3.77	3.83
Perceived support for reading habits	3.73	3.80
Overall mean	3.72	3.80



Table 1 shows that students responded positively to RBQ in both cycles. The overall mean increased from 3.72 in Cycle 1 to 3.80 in Cycle 2, and all four aspects increased and remained in the Very High category (3.26–4.00) in both cycles. The largest increase was observed in user experience (0.10 points), followed by usability (0.09), perceived support for reading habits (0.07), and motivation and engagement (0.06).

These increases followed refinements made after Cycle 1, when student responses and feedback indicated a need for greater variation in reading challenges and more options to accommodate differences in students' interests and preferences. The refinements focused on the variety of reading challenges, reading categories and difficulty options, and the presentation of gamification features, with visual and interface elements also adjusted to make the platform more flexible and engaging.

DISCUSSION

Integrating Reading Activities and Gamification in a Digital Environment

The findings show that RBQ was developed as an integrated digital reading environment rather than as a digital copy of the printed program. This integration matters because the game elements are tied directly to the reading activities: points, badges, and the leaderboard follow from students' completion of reading challenges and progress within the platform, rather than functioning independently of the literacy objectives. This is consistent with previous research on the potential of gamification and digital learning environments to support engagement in reading and learning activities (Al Ali et al., 2024; Li & Chu, 2021; Wang et al., 2024). The present study extends this perspective by showing how gameful elements can be embedded within a structured reading activity rather than presented as separate motivational features.

The development process also suggests that digital transformation can address organizational aspects of reading activities. The reading log and teacher dashboard provide mechanisms for documenting and monitoring participation, while the student interface provides direct access to challenges and progress information. Research on technology use in secondary schools commonly frames the factors that shape it in terms of teachers' will, skills, and tools (Schmitz et al., 2022), and similar factors, namely teachers' digital competence, school infrastructure, and school culture and leadership, were found to shape technology integration among Indonesian teachers (Hilya Aeni et al., 2025). Wider use of a platform such as RBQ may



therefore depend on teachers' and librarians' willingness and skills as well as on the availability of devices and connectivity.

Student Responses to Usability, User Experience, and Engagement

Students responded positively across all four dimensions in both cycles, and each dimension increased after refinement. The increases in usability and user experience suggest that the quality of a gamification-based learning platform depends not only on the presence of game elements but also on how easily students can interact with the system and how they perceive the overall experience. This is relevant to the MARS perspective, which links application quality to functionality and aesthetics as well as engagement (Terhorst et al., 2020). Here, expert feedback on visual presentation and responsiveness, together with students' responses on usability and user experience, indicates that technical and visual considerations are closely connected with students' experiences of the platform.

The consistently positive responses on motivation and engagement may be related to the integration of points, badges, the leaderboard, and progress indicators with reading challenges, which provide visible markers of participation and achievement and potentially make reading activities more interactive and recognizable to students. This is in line with previous studies on the role of gamification in supporting motivation and engagement in educational contexts (Dah et al., 2023; Funa et al., 2021). However, the findings are best understood as students' responses to the gamified learning environment as a whole: the data describe how students perceived and experienced the platform during the evaluation cycles rather than establishing the independent contribution of individual game elements.

Supporting Reading Practices Through Structured Challenges and Reflection

Perceived support for reading habits also increased after refinement, suggesting that the modifications were accompanied by more positive student responses toward RBQ's role in supporting reading activities. This dimension was addressed through interconnected components of RBQ, particularly the reading challenges, reading log, and reflection activities.

The Bingo structure gives students a set of organized reading activities rather than an entirely open-ended task, with categories and levels of difficulty providing variation. The reading log provides a space to document reading experiences, and reflection encourages students to revisit and articulate what they have read, which is consistent with a qualitative study in which



undergraduate students reported that reading logs in an extensive reading class helped build their reading habits and interest (Zur et al., 2025). Rather than relying solely on motivational elements, RBQ thus offers a sequence in which students encounter a reading challenge, complete the activity, receive progress-related feedback, and document aspects of their reading. The game elements provide an external structure for participation, while the reading log and reflection maintain the literacy-oriented purpose of the platform, illustrating that gamification can be integrated with reflective learning practices.

This design relates to the perspectives on reading habits represented by the SRHI-R and RHI (Schmidt & Retelsdorf, 2016; Senthilkumaran & Revathi, 2022), which were translated into RBQ's activities and evaluation items focusing on students' engagement with reading activities and their perception of the platform's support.

Iterative Refinement as a Core Component of EDR

The increase in scores across the two cycles also illustrates the role of iteration in EDR. In this study, the analysis of contextual needs, expert validation, and student evaluation each informed the design, and the two-cycle evaluation functioned as an integral part of development rather than as a separate final assessment. This reflects the central principle of EDR that design decisions should be informed by evidence obtained from authentic implementation (McKenney & Reeves, 2018).

The consistency of the changes across all four dimensions suggests that the refinement addressed the platform as a whole rather than only its gamification components. The findings also support the importance of considering learner preferences and contextual characteristics when designing gamified learning environments, as previous studies have emphasized (Al-Hafdi & Alhalafawy, 2024; Moyano-Barahona et al., 2025). In this study, student feedback indicated which aspects of the platform needed adjustment, showing how user feedback can function as design knowledge within an EDR process.

Implications for the Development of Gamification-Based Reading Media

The findings have three implications for the development of digital media that support reading activities. First, gamification elements need to be meaningfully connected to the learning activity. Points, badges, and leaderboards are more pedagogically relevant when tied directly to the completion and progression of reading challenges, which positions gamification as one



component of a broader digital environment that structures and supports reading rather than as an isolated motivational technique.

Second, a gamified reading platform needs to provide more than motivational features. Usability, interface presentation, responsiveness, documentation, and monitoring functions are also important components of the overall learning experience, as the expert validation and student evaluation in this study show.

Third, initial designs may need to be adjusted after interaction with actual users, as the refinement of challenge variety, categories, difficulty options, and interface elements demonstrates. This reinforces the role of EDR as a development approach that connects contextual needs, design decisions, implementation, and reflection.

CONCLUSION

This study developed and evaluated RBQ, a gamification-based digital platform designed to support students' reading activities and reading habits. Using an Educational Design Research approach, the development process connected contextual analysis, platform development, expert validation, and iterative evaluation with students.

Regarding the first research question, the analysis of the printed Reading Bingo program identified limitations in manual recording and monitoring, in student engagement, and in structured rewards and visible progress tracking. These needs were translated into a platform that integrates reading challenges, gamification, reading documentation, reflection, and progress monitoring, which experts judged suitable for implementation with minor revisions (overall mean 3.65 across material, pedagogical, technical, and visual aspects).

Regarding the second research question, student responses were positive in both cycles. The overall mean increased from 3.72 in Cycle 1 to 3.80 in Cycle 2, with improvements in usability, user experience, motivation and engagement, and perceived support for reading habits. Based on Cycle 1 feedback, RBQ was refined in the variety of reading challenges, reading categories and difficulty options, and the presentation of gamification features and interface elements. Iterative refinement was thus accompanied by more positive responses, and the study shows that EDR allows feedback from implementation to be translated into concrete design refinements. The contribution of this study lies in showing how structured reading challenges, gamification, reading documentation, reflection, and progress monitoring can be combined in a single digital environment and progressively refined.



Several limitations should be acknowledged. The study involved a small sample of 15 student librarians from a single school, recommended by the school librarian, so the findings may not represent other students or contexts. The same students took part in both cycles, so the higher Cycle 2 scores may partly reflect familiarity or novelty effects. The study had no comparison group and used descriptive analysis only, which does not allow causal claims. The data were self-reported perceptions, the questionnaire's reliability was not tested statistically, and mean scores were close to the upper limit of the scale (3.72 and 3.80), which limited room for improvement. Finally, the short trial periods did not allow sustained changes in reading habits to be examined.

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