Product: StoryQuest – A Children's Reading & Vocabulary Learning App

1. Introduction

This report presents the design, research foundations, and development of StoryQuest, a mid-fidelity interactive digital reading tool for children aged 6–10. Guided by principles from Human–Computer Interaction (HCI), usability theory, child-centred design, and interaction design frameworks (Preece, Rogers & Sharp, 2015), StoryQuest was conceptualised as a reading companion supporting vocabulary development, reading comprehension, and motivation through interactive features.

The report follows the structure outlined in the coursework specification. Section 2 presents an annotated bibliography of key academic sources informing the design. Section 3 details the product design, including conceptual background, metaphors, assumptions, interaction types, and design process. Section 4 introduces the mid-fidelity prototype, discussing design choices, iterations, and alignment with HCI principles. Section 5 proposes an empirical research study to validate assumptions underlying the design, including study materials and methodology. The report concludes with reflections on learning and future design considerations.

2. Annotated Bibliography

2.1 Norman, D. (2013). *The Design of Everyday Things*. MIT Press.

Summary:
Norman introduces core usability concepts such as visibility, feedback, conceptual models, affordances, constraints, and mappings. These principles describe how users interpret interfaces and form expectations.

Reflection:
This source was selected because StoryQuest heavily depends on visual clarity and intuitive interactions for children. Norman's emphasis on *visibility* and *affordances* shaped decisions such as large buttons, rounded shapes, simple vocabulary pop-ups, and predictable screen layouts. The idea that "the user should not need instructions" was essential, given young readers' limited literacy. This allowed me to design an interface that encourages self-directed exploration and low cognitive load.

2.2 Nielsen, J. (1994). *10 Usability Heuristics for User Interface Design*. Nielsen Norman Group.

Summary:
Nielsen presents widely used heuristics including consistency, user control, error prevention, feedback, and recognition over recall.

Reflection:
Nielsen's heuristics directly informed the quiz and vocabulary features. *Error prevention* influenced the use of single-choice radio buttons rather than text input fields. *Consistency* guided the use of uniform button styles across all screens. *Recognition over recall* inspired the use of icons and book covers rather than text lists. This source anchored the design to established usability guidelines.

2.3 Preece, J., Rogers, Y. & Sharp, H. (2015). *Interaction Design: Beyond Human–Computer Interaction*. Wiley.

Summary:
This textbook outlines frameworks for conceptual design, prototyping, feedback cycles, and methods for generating, refining, and evaluating prototypes.

Reflection:
The design process section (Chapter 12.5) directly informed the prototype's evolution—from sketches to mid-fidelity Axure screens. This source validated using iterative refinement, ensuring UI elements were tested and improved through multiple passes. It also influenced the task flows (e.g., Home → Explore → Reading → Quiz → Rewards).

2.4 Shneiderman, B. et al. (2016). *Designing the User Interface*. Pearson.

Summary:
Shneiderman's Eight Golden Rules emphasise interface consistency, informative feedback, error handling, and reducing short-term memory load.

Reflection:
This was especially relevant for child users. StoryQuest reduces memory load by using single screens with limited options. The reading flow avoids deep menu layers. The rules also reinforced adding clear confirmation panels (Correct / Wrong) after quiz interactions. This source helped justify the design from a cognitive perspective.

2.5 Van der Meij, H. & de Jong, T. (2003). "Learning with multimedia…" *Educational Technology Research & Development*.

Summary:
This study found that audiovisual annotations and pop-ups help children learn new vocabulary and improve comprehension.

Reflection:
This research closely matched StoryQuest's target functionality. It justified the vocabulary pop-ups activated on tap. Their finding that short, simple explanations

improve retention shaped the wording of definitions such as "Breeze: a soft, gentle wind." It provided strong evidence that embedded learning supports reading development.

2.6 Rose, S., et al. (2020). "User Interface Design for Children." *International Journal of Child–Computer Interaction*.

Summary:
The paper explores how children interact with digital interfaces, highlighting the importance of large touch targets, vibrant colours, and immediate feedback.

Reflection:
This directly influenced layout decisions. Large buttons, bright colours, and minimal text were used intentionally. The paper highlighted children's reliance on visual cues, which shaped the use of icons and large book-cover thumbnails on the Explore page.

2.7 Read, J. & MacFarlane, S. (2006). "Using interaction design methods with children." *IDC Conference*.

Summary:
Discusses child-centred design methods and stresses the importance of observing how children explore interfaces.

Reflection:
This encouraged designing StoryQuest so children can safely "experiment" without damaging progress—meaning forgiving interactions, simple undo pathways, and repeatable actions. This validated the soft and safe quiz structure with "Try Again" rather than penalties.

2.8 Hirsh-Pasek, K. (2015). "The Four Pillars of Learning in Children's Apps." *Child Development Perspectives*.

Summary:
Identifies the pillars of effective learning tools for children: active engagement, meaningful learning, social interaction, and guided exploration.

Reflection:
This was selected to support the educational value of StoryQuest. The guided reading page and vocabulary triggers encourage meaningful engagement. The quiz and reward sequence reinforce learning in a structured but playful way. This source gave strong educational validity to the app concept.

3. Product Design

3.1 Design (Conceptual Design)

Concept Overview

StoryQuest is designed as a guided digital reading companion for early readers (ages 6–9). Its purpose is to help children explore stories, read short chapters, learn new vocabulary in context, test comprehension through simple quizzes, and stay motivated with rewards.

The system emphasises simplicity, visual clarity, and immediate feedback, which are essential for young learners (Rose et al., 2020).

Exploring Storybooks

The Explore page uses a bookshelf metaphor to let children browse stories visually. Large book covers, high spacing, and minimal text reduce cognitive load and support recognition-based navigation, which research shows is more suitable for young users (Read & MacFarlane, 2006).
Tapping a book leads to a Book Detail page with a short summary and a "Start/Continue" button, maintaining a simple one-task-per-screen approach (Norman, 2013).

Reading Short Chapters

Chapters are intentionally short to match children's limited attention spans. Text is displayed with:

- large readable fonts

- high contrast

- simple forward/back navigation

Key vocabulary appears highlighted, signalling that help is available without interrupting the reading flow. The structure is linear, which prevents confusion and helps children stay focused on the narrative Shneiderman et al.'s (2016)

Vocabulary Learning

Tapping a highlighted word opens a dynamic panel flashcard with:

- a child-friendly definition

- an image

- a simple example sentence

This supports contextual vocabulary learning (Van der Meij & de Jong, 2003) and provides immediate feedback. The card follows a consistent format so children always know what to expect, reducing cognitive effort and maintaining usability.

Comprehension Quizzes

After reading, children answer a very short multiple-choice question.
The quiz uses:

- radio buttons (one correct option)

- a clear Submit button

- instant "Correct!" or "Try Again" pop-ups

Feedback is designed to be encouraging rather than evaluative, matching classroom-style positive reinforcement. The goal is to confirm understanding, not to penalise mistakes. Nielsen's (1994)

Rewards System

The Rewards page uses a sticker/badge collection metaphor familiar to children. Badges are earned for actions such as completing chapters or quizzes.
Rewards provide:

- motivation

- visible progress

- reinforcement of consistent reading habits

This supports engagement through simple gamification appropriate for learning environments (Hirsh-Pasek et al., 2015).

Main User Tasks

Children perform the following tasks:

1. Browse and select a book

2. Start or continue reading

3. Tap highlighted words for vocabulary help

4. Answer a short comprehension quiz

5. Earn and view badges

These tasks are intentionally sequential, making the experience predictable and easy to follow.

Interaction Types

StoryQuest relies mainly on:

- Tap interactions (most intuitive for children)

- Dynamic panels (pop-up vocabulary, quiz feedback)

- Page-to-page navigation buttons

- Consistent UI placement for motor memory

Complex gestures (swipes, multi-touch) are avoided to prevent accidental actions.

Design Metaphors

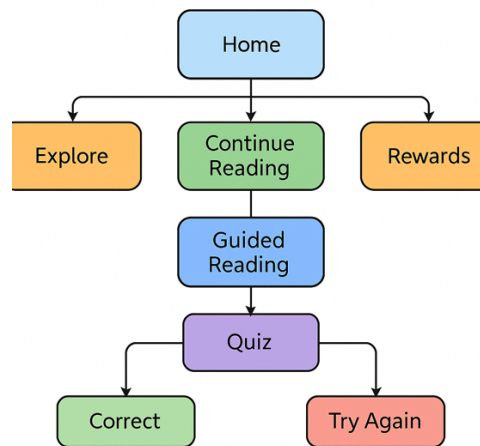| Metaphor	Use	Purpose
Bookshelf	Explore	Helps children recognise book selection
Flashcards	Vocabulary pop-ups	Familiar learning tool for new words
Stickers/Badges	Rewards	Encourages motivation
Teacher-style feedback	Quiz pop-ups	Emulates supportive learning atmosphere

Metaphors reduce cognitive load and support intuitive interaction.

Design Process (Preece et al., Ch. 12.5)

The design followed the recommended prototyping cycle:

1. Sketching rough layouts of main pages

2. Low-fidelity wireframes to plan structure and navigation

3. Mid-fidelity Axure prototype with interactive elements

4. Iterative refinement: improving vocabulary pop-ups, quiz logic, spacing, and visual consistency

This iterative approach ensured usability improvements while aligning with HCI theory.

3.2 Design Principles

Visibility

Visibility ensures users can immediately understand what actions are available. In StoryQuest, key actions such as "Explore Stories" and "Continue Reading" are displayed as large, clearly labelled buttons (Norman, 2013) placed in the centre of the screen.
Pop-ups (for vocabulary or quiz feedback) also appear centrally, with a visible close button so children always know how to return to the main task.
The simple, linear layout acts almost like a breadcrumb trail, helping children understand where they are in the reading journey without extra text.
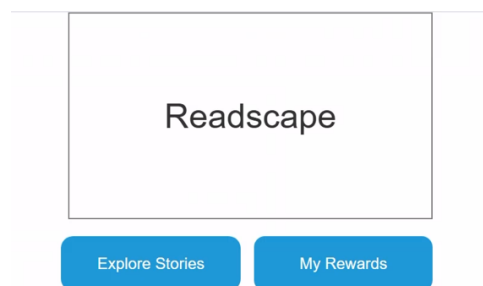

Figure 1. Visibility demonstrated through large labelled buttons on the Home screen.

Feedback

StoryQuest provides immediate responses to user actions so children feel supported.
Tapping a highlighted vocabulary word instantly opens a pop-up, confirming the system understood their action.
During quizzes, a Correct or Try Again panel appears right after submitting an

answer, reinforcing learning in a friendly way Nielsen's (1994).
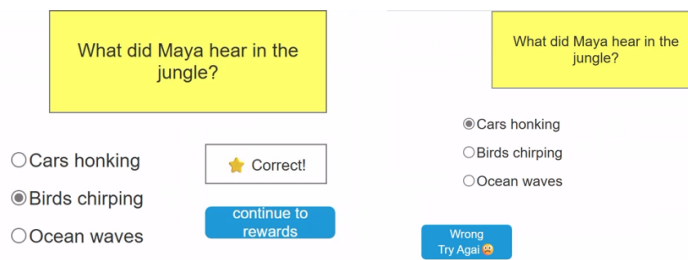Navigation buttons briefly change state (colour or depth), giving a subtle signal that the tap was recognised.

Figure 2.Immediate feedback shown through the "Correct!" pop-up after submitting a quiz answer.

Constraints

Constraints help prevent errors and reduce cognitive load.
For example, the quiz uses radio buttons, allowing children to choose only one answer and avoiding confusion.
Each screen focuses on one main action (e.g., Read, Explore), which prevents decision overwhelm and keeps attention on the task.

Consistency

Consistency helps children build confidence by recognising familiar patterns.
StoryQuest uses a uniform colour palette, repeated rounded buttons, and the same text styles across all pages Shneiderman et al.'s (2016)
Navigation buttons appear in consistent locations, and all vocabulary and quiz pop-ups follow the same design layout, making interactions predictable and easy to learn.
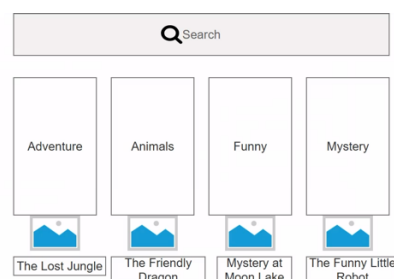

Figure 4. Consistent interface elements demonstrated by uniform button shapes and visual styling across screens.

Affordances

Affordances in the design signal what children can interact with.
Buttons appear slightly raised and rectangular, resembling physical pressable elements.
Book covers function as large tap targets, signalling that they can be selected.

Highlighted vocabulary words provide a clear visual cue that they are interactive and lead to additional meaning Norman's (2013).
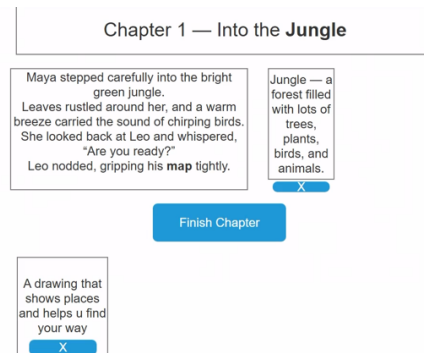

Figure 5. Affordances shown through tappable book-cover images and highlighted vocabulary that indicates interactivity.

4. Prototype

The StoryQuest prototype was developed in Axure RP as a **mid-fidelity interactive model** that demonstrates the core user experience of the reading platform. The prototype includes functional navigation, interactive vocabulary elements, a branching quiz, reward pathways, and a progress-tracking system. Each screen has been designed to reflect the design principles discussed earlier Nielsen (1994) and Norman (2013), ensuring clarity, consistency, and ease of use for young readers.

Interactivity Features

The prototype integrates several interactive behaviours that simulate how the final product would function:

- **Page linking** to allow smooth transitions between Home, Explore, Book Detail, Guided Reading, Quiz, and Rewards pages.

- **Dynamic vocabulary pop-ups**, which appear when users tap highlighted words in the reading section.

- **A functioning quiz system**, using conditional logic to display either a "Correct!" or "Try Again" panel based on the selected answer.

- **A reward pathway**, enabling users to view badges earned after completing the quiz.

- **A progress screen**, displaying user achievements and reinforcing motivation through visual rewards.

Design Iterations

During development, several refinements were made based on usability expectations for young readers:

- **Reduced text per screen** to prevent cognitive overload and maintain engagement.

- **Enlarged and simplified button layouts** to accommodate children's motor skills and support quick decision-making.

- **Adjusted quiz interactions** to provide immediate and encouraging feedback.

- **Added a "Try Again" response** to create a safe, low-pressure learning environment.

- **Integrated expressive elements**, such as a sad emoji for incorrect answers, to strengthen emotional cues and help children understand outcomes.

Prototype Strengths

The final prototype demonstrates a cohesive and realistic user journey that aligns with HCI principles such as visibility, feedback, constraints, and affordance. It models how a child would explore stories, learn new vocabulary, complete a comprehension task, and receive rewards. Although mid-fidelity, the prototype effectively communicates the intended design direction and can be evaluated in the proposed user study.

5. Research Study

This section proposes an empirical usability study designed to evaluate a key assumption underlying the StoryQuest prototype: that guided vocabulary interactions (highlighted words + pop-up definitions) improve children's comprehension and engagement during reading (Read & MacFarlane, 2006).

The study is structured so that a usability researcher could run it independently using the plan and materials provided. (Read & MacFarlane, 2006).

5.1 Research Question and Hypothesis

Research Question

To what extent do interactive vocabulary pop-ups in StoryQuest improve children's reading comprehension and engagement compared to reading without interactive support?

Hypothesis

H1: Children who use the interactive vocabulary pop-ups will demonstrate **higher comprehension scores** and **greater engagement** than children who read the same text without pop-ups.

H0: There will be **no difference** between the two groups.

5.2 Study Design

A **between-subjects study** is proposed with two groups:

- **Condition A (Interactive Reading):** Children read a StoryQuest chapter with highlighted vocabulary and pop-up definitions.

- **Condition B (Static Reading):** Children read the same chapter without vocabulary highlights or pop-ups.

This design allows clear comparison while reducing learning bias.

Study Type

Moderated, task-based usability study with post-task questionnaire and brief interview.

5.3 Participants

Target Users

Children aged **6–9**, English-speaking, early-stage independent readers.

Recruitment

Participants will be recruited through:

- local primary schools

- community centres

- parental volunteer mailing lists

Sample Size

A recommended sample of **10–12 participants** (5–6 per condition), sufficient for qualitative usability testing and basic comparison trends.

Inclusion Criteria

- basic reading skills

- no diagnosed reading impairment (to ensure consistency)

Exclusion Criteria

- children with severe visual or motor impairments that would affect tablet use (These could be separately studied in accessibility-focused research.)

5.4 Materials

The researcher will use:

- The **StoryQuest Axure mid-fidelity prototype**

- A researcher tablet or laptop

- **Task script** (instructions for the child)

- **Consent forms** (parent/guardian + child assent)

- **Post-task questionnaire** (emoji-based Likert scale)

- **Short interview prompts**

- **Observation sheet**

5.5 Procedure

Step 1: Welcome + Consent (2 minutes)

- Researcher welcomes participant and parent.

- Parent signs consent; child gives verbal or written assent.

- Researcher explains the purpose in child-friendly language:
  "We want to see how easy this reading app is to use."

Step 2: Task Instructions (1 minute)

Children are told:
"You will read a short story and then answer a question. Tap anything that looks interesting."

Step 3: Reading Task (3–5 minutes)

Participants read a short chapter in the prototype:

- **Condition A:** Can tap highlighted vocabulary for pop-ups

- **Condition B:** Reads static text only

Researcher does not assist unless the child is stuck.

Step 4: Comprehension Quiz (1–2 minutes)

Child answers the single quiz question included in the prototype.

Outcome is recorded:

- Correct

- Incorrect + number of attempts

Step 5: Post-task Questionnaire (1 minute)

Questions include:

- "Was the story easy to follow?"

- "Did anything confuse you?"

- "Did tapping the words help you?" (Condition A only)

Step 6: Short Interview (2 minutes)

Open-ended questions:

- "What part did you like most?"

- "Was anything too hard?"

- "If you could change something, what would it be?"

Step 7: Debrief (1 minute)

Researcher thanks the child and explains the goal of the study.

5.6 Data Analysis Plan

Quantitative Data

- Quiz accuracy (correct/incorrect)

- Time taken to complete reading

- Engagement rating from emoji questionnaire

- Number of vocabulary pop-up interactions (Condition A only)

Analysis:

- Compare Condition A vs. Condition B for:

  o comprehension scores

  o engagement ratings

  o task duration

Simple descriptive statistics (means, percentages) are sufficient for this coursework.

Qualitative Data

From interviews and observations:

- Noting confusion points

- Emotional reactions

- Comments about vocabulary learning

- Behavioural markers of engagement (e.g., tapping, reading aloud)

Thematic analysis will be used to identify recurring patterns (e.g., "liked tapping words," "got confused by navigation," etc.).

5.7 Expected Outcomes

Based on HCI research and the design intent, the expected results are:

- Children in **Condition A** will look up more words and show better comprehension.

- They will report higher engagement because the pop-ups make reading feel interactive.

- The quiz performance is likely to be higher for Condition A due to improved vocabulary understanding.

- Children in Condition B may skip unfamiliar words or show confusion about meaning.

These findings would validate the hypothesis and support continued development of StoryQuest's interactive vocabulary system.

5.8 Study Risks and Ethical Considerations

- All participation is voluntary.

- No identifiable data will be collected.

- Children may withdraw at any point.

- The content is child-appropriate and non-sensitive.

- Parents must be present in the room for safety.

6. Conclusion

This coursework demonstrated the integration of HCI principles into the design of StoryQuest, a reading and vocabulary learning app for children. Through academic research, I developed a deeper understanding of how children interact with digital interfaces—particularly the importance of visibility, feedback, and simplicity.

The project reinforced the importance of designing for real user needs rather than assumptions. I learned that even small elements, such as button size or pop-up clarity, have significant effects on a child's confidence and success. The HCI theories

explored will shape my approach to future design work, emphasising user-centred processes, iterative refinement, and evidence-led design.

REFERENCES

1. Norman, D. (2013). *The Design of Everyday Things*. MIT Press.

Link: https://mitpress.mit.edu/9780262525671/the-design-of-everyday-things/

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2. Nielsen, J. (1994). '10 Usability Heuristics for User Interface Design'. Nielsen Norman Group.

Link: https://www.nngroup.com/articles/ten-usability-heuristics/

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4. Shneiderman, B., Plaisant, C., Cohen, M., Jacobs, S., Elmqvist, N. & Diakopoulos, N. (2016). *Designing the User Interface*. Pearson.

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8. Hirsh-Pasek, K. et al. (2015). "The Four Pillars of Learning in Children's Apps." *Child Development Perspectives*, 9(1), pp. 23–29.

Wiley Online Library: https://srcd.onlinelibrary.wiley.com/doi/full/10.1111/cdep.12175

APPENDICES

Appendix A — Literature Search Strategy

Databases Consulted

- Google Scholar

- ACM Digital Library

- SpringerLink

- ResearchGate

Search Terms Used

- "children's reading engagement"

- "interactive vocabulary learning"

- "HCI design for children"

- "digital reading comprehension tools"

- "gamification early literacy"

- "child-computer interaction AND reading"

- "educational apps vocabulary learning"

Search Process Summary

1. Started with general terms to understand the landscape of children's digital reading tools.

2. Narrowed search to HCI-focused academic papers on child–computer interaction, literacy, learning support mechanisms, and feedback systems.

3. Filtered results to peer-reviewed sources only.

4. Selected 8 key papers based on relevance, theoretical contribution, and applicability to the StoryQuest concept.

Inclusion Criteria

- Peer-reviewed academic sources

- English language

- Focus on HCI, interaction design, literacy development, or children's learning behaviour

Exclusion Criteria

- Non-academic blogs or websites

- Studies unrelated to children or reading

- Adult learning or workplace training studies

Appendix B — Parent/Guardian Consent Form

Study Title: Evaluating the Usability of the StoryQuest Reading Prototype
Researcher: *Sanjida khan* — University of Greenwich

Purpose of the Study

Your child is invited to help test a children's reading app prototype. The goal is to understand how easy the app is to use and whether vocabulary pop-ups support learning.

What Participation Involves

Your child will:

- read a short story on a tablet/laptop

- tap highlighted words (depending on study condition)

- complete a simple quiz

- answer a short emoji-scale questionnaire

- take part in a brief 1–2 minute interview

Total time: **8–10 minutes**

Risks and Benefits

- No risks are involved.

- Participation may help improve future educational apps.

Confidentiality

No personal data will be collected. No images or recordings will be stored. Responses are anonymous.

Voluntary Participation

Your child may stop at any time without penalty.

Consent Declaration

Please tick:
☐ I have read and understood the study information.
☐ I consent for my child to take part in this study.
☐ I understand participation is voluntary and anonymous.

Child's Name: _____

Parent/Guardian Name: _____

Signature: _____ **Date:** _____

Appendix C — Child Assent Form

Hi! We are testing a reading app, and we want to know what you think.
You will read a short story and answer one question.
If you don't want to continue at any time, just tell us.

Do you want to take part?

☐ **Yes!**
☐ **No, thank you**

Child's Name: _____
Signature (optional): _____

Appendix D — Post-Task Questionnaire

Please circle the face that shows how you feel:

1. **Did you enjoy using the reading app?**
😀 😃 🙂 😐 🙁

2. **Was the story easy to understand?**
😀 😃 🙂 😐 🙁

3. **Was anything confusing?**
😀 😃 🙂 😐 🙁

4. **Did tapping the highlighted words help you?**
😀 😃 🙂 😐 🙁

5. **Would you use this app again?**
😀 😃 🙂 😐 🙁

Appendix E — Interview Questions

Short interview questions for qualitative insight:

1. "What was your favourite part of the app?"

2. "Was anything hard to use or confusing?"

3. "How did you feel about tapping the highlighted words?"

4. "Did the pop-ups help you understand the story better?"

5. "What would you change to make the app better or more fun?"

Appendix F — Observation Sheet (Researcher Use Only)

Observation Category   **Notes**

Engagement (interest, smiling, tapping confidently)

Confusion (hesitation, looking for buttons, repeated tapping)

Use of vocabulary pop-ups

Time taken to complete tasks

Quiz performance

Need for assistance

Emotional responses (frustration, enjoyment)

Appendix G — Task Script for Researcher

Read aloud to the child:

"Thanks for helping today! First, you'll read a short story on this screen.
If a word looks interesting or highlighted, you can tap it.
At the end, you'll answer a little question.
There are no right or wrong answers — just try your best."

Task Steps:

1. Open the reading screen

2. Ask the child to read the passage

3. Allow tapping of highlighted words (Condition A)

4. Ask the child to complete the quiz

5. Provide access to the reward screen

6. Complete questionnaire + interview

Appendix H — AI Use Declaration (Required by University)

AI Use Statement

AI tools (e.g., ChatGPT) were used to support the development of written sections, refine language, and assist with structuring the report. All ideas, decisions, prototype design, and final academic judgements remain my own.

All sources used in the annotated bibliography were independently searched and verified.

The prototype was fully created by the student.

Name: _____Sanjida khan_____

Date: _____5th December 2025_____