

Book Buddy - Enchanting a Bookmark

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1 ABSTRACT

General reading skills have been declining for years. Thus this paper will discuss the development of a bookmark with the goal of making the reading experience more enchanting and encouraging people to read more. This is done by using a user-centered approach and the triple diamond model, where diverging and converging are used to develop a low-fidelity and a high-fidelity prototype of an enchanting bookmark. This resulted in a bookmark that keeps track of reading goals and allows the users to be connected to their friends while reading. In every step of the process, user feedback is used to improve the design and the final prototype was evaluated with a user study. The subsequent result showed a difference between the user group of people who read frequently and those who want to read more. The first group preferred the enchanting and social aspects of the bookmark, while the second group focused on the motivational aspect.

2 INTRODUCTION

Reading skills in children have been declining to the point where two thirds of American kids are behind on their reading skills, and the reading skills in the Netherlands have kept declining as well [2, 6]. Reading is often seen as a task and an obligation, not something that is done for the pleasure of reading [8]. Because of this, we want to find a way to make reading engaging and fun again.

Studies have been done on how to increase the social factors of reading while using an e-reader by letting users see which parts are highlighted often by other users [3, 10, 21]. Even though these social features help encourage reading new books, the features are limited and depersonalised [3]. Additionally, these studies are focused on e-readers, yet children are observed to learn better and gain more benefits from reading paper books instead [16]. Thus it is important to look into ways of making reading physical books more fun and immersive.

One way to do this is by making aspects of reading more enchanting. Since reading itself can already be quite enchanting, increasing this might motivate people to read more [8]. A component that is well-suited to do this is the bookmark, as it is often an integral part of reading a physical book for many readers [19, 26], and little research is done on the design of bookmarks. Currently most bookmarks are very practical; a thin piece of plastic or paper that one can put in between the pages. Sometimes they are made to look good and some bookmarks have a reading light, but other than that there are few variations of bookmarks that are made to enhance the reading experience. That is why this research aims to develop a bookmark that is both enchanting and encourages people to read

more often. This will be done by first exploring what enchantment is, and what existing research is done on the experience of reading and bookmarks. Then a bookmark will be designed and built using a triple diamond design. All steps of this design process will be user-centered and iterative. As such, multiple steps will include user research. After developing the high fidelity prototype, a last user study will be conducted and the eventual design will be evaluated.

3 RELATED WORK

3.1 Enchantment

To create an enchanting bookmark, it has to be determined what enchantment means, how it can be measured, and how something can be made enchanting. The Cambridge Dictionary makes a difference in enchantment in the sense of pleasure and enchantment as magic [1]. Here enchantment as pleasure is described as '*a feeling of great pleasure and attraction, especially because something is beautiful*', while the definition focusing on the magical aspect is '*something that is thought to have magical powers over someone*' [1]. This definition already shows how there are multiple aspects of enchantment and multiple definitions. In a study by Curry [9] it is said that normally enchantment is seen as something fluffy, something vague, separate from the real world, with no real definition. It is a personal and important affect, connecting to intrinsic values and a personal meaning of life. This is comparable to other studies, which emphasise the importance of enchantment, while focusing on the subjective definition of the word. As such, enchantment can be seen as an immersive life affirming moment [20], but also as the experience of wonder and letting oneself be moved, which consequently enhances critical thinking and creative potential [22].

Despite there being a lack of a real definition and measurement of enchantment, there are studies which try to make the concept more graspable. A study by Lakshmi and Tamilmani [14] focuses on how nature enhances enchantment objectively. This is done by looking at existing literature and studying which parts can make a story more enchanting. This shows how nature increases the experiences of enchantment in a story. Similarly, research has shown that nature can induce physiological reactions such as lower diastolic blood pressure, less negative and more vigorous moods, and lower sympathetic nervous system activity, increasing relaxation and immersion [25]. Despite this study not focusing on enchantment itself, it does display how nature impacts immersion, which according to the definition of Pyyry and Aiava [20] is related to enchantment. Even though most definitions are subjective, one study created a list of adjectives related to enchantment as an attempt to measure enchantment [12]. This list offers a consistent way to

measure enchantment in an objective manner, despite it being a subjective experience.

2

3.2 Experience while reading

To be able to make the reading experience more enchanting, it is important to first get an impression on important aspects of reading experiences. Most research on this topic focuses on the impact of the text itself. For example, one study depicted an outline of the different emotions a reader goes through and how these are triggered [11]. This study showed how important it is to get in a flow while reading and not have something take you out of this flow, as this stops the reader from reading. This flow is defined as being engaged with the book and losing track of time, which is comparable to being immersed [11]. It is explained that the reader starts either in a neutral state or a state of flow, after which flaws in writing take them out of these states. Another study which focuses on the experience of reading is mainly focused on how to engage readers in a classroom setting. This study emphasises the importance of reading for development and social interactions, and how reading together with others increases the engagement and motivation for reading, as well as increasing the immersion and thus improving the overall experience [13].

This shows that some research is done on reading experience and how this can be influenced, but this research is either focused on the text itself or the context of a class, despite there being many other factors that can influence the experience while reading. One of which is the motivation for reading itself. A study from Burnett and Merchant [8] focuses on the current emphasis on reading for information and self-improvement and how this may be discouraging. While reading for pleasure or even enchantment, the expectation may become a source of encouragement, since it creates an excitement for what is coming and a curiosity to see how events in the story unfold [8]. This shows how a shift in focus on why we read and how to encourage someone to read might be beneficial to increase how much people read.

3.3 Social reading

One aspect that might encourage reading is the social aspect of reading. The study from Ivey and Johnston [13] already showed how a classroom setting influences the experience while reading. Other studies confirm this idea that reading with others helps the reader understand what they are reading and engaging with the material [23], and it can establish social groups and ways of interacting with others [7]. Both these studies also focus on the context of a class, but show similar results on how a social context encourages reading and improves its benefits. A study on the impact of reading on social-cognitive skills even shows an improvement in these skills when someone reads more fiction books [18].

3.4 Existing research on bookmarks

The existing research shows that most research on reading emphasizes on either the text itself, or a classroom environment and its impact on the reading experience, while focusing on the enchantment and pleasure of the experience might be a better way to increase how much people read [8]. When the e-reader started

to become more popular, some studies focused on how to design a digital bookmark for an e-reader [19, 26]. These studies emphasize the importance of bookmarking in the user experience of reading, but the focus is on how to translate this to e-readers. Except for this, there is barely any research done on the impact of bookmarks on the reading experience. One scientific study designed a bookmark which keeps track of the light strength surrounding the book and time while reading [27]. They used a bookmark since it is already a part of the reading process. However, the goal of this bookmark is not to enhance the reading experience, but to reduce myopia by making the reader aware of the environment being not well-lit enough to read, and of them having been reading for too long [27].

Overall, the literature shows that there is a lack of research on how to improve the reading experience for the reader. One way to improve the experience might be to make it more enchanting or by looking at a near intrinsic part of the reading experience: the bookmark. This is why it is relevant to create a more enchanting version, to see the effects this might have on the experience while reading. Therefore, this research aims to answer how a bookmark can make reading more enchanting, and how it can encourage people to read more often.

4 DESIGN

4.1 Triple Diamond Design Diamond Model

In the project of designing an enchanted bookmark, we utilized the Triple Diamond method introduced by [17]. The advantages of this method lie in its versatility across various contexts for innovation and product development. The paper also provides detailed rubrics for evaluating the application of the Triple Diamond method to assess the effectiveness and thoroughness of the problem-solving process which shall be used in the following sections.

According to the paper [17], with the increasing complexity of processes and problems, there is a growing need for more structured approaches to guide each phase from problem identification to the development of an action plan. Such methods incorporate both divergent techniques, facilitating the generation of a wide range of alternatives, and convergent techniques, which are crucial for analyzing and narrowing down those options. Based on the Steps of the Triple Diamond Framework, and the User Centered Design approach that was presented in our lecture we executed the following steps in our design process:

- (1) Explore - divergent step
- (2) Define - convergent step
- (3) Sketch (Understand) - divergent step
- (4) Decide (Focus) - convergent step
- (5) Develop - divergent step
- (6) Validate (Filter) - convergent step

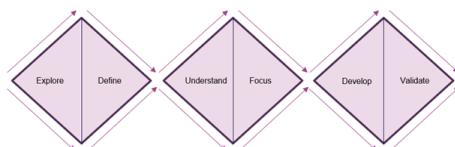


Figure 1: The Triple Diamond Model

The three pairs of subsequent divergent and convergent steps create the triple-diamond model of our design process, as can be seen in Figure 1. For these steps, we utilized a variety of divergent and convergent methods such as concept mapping, design synthesis, story boarding, customer journey mapping, and many others. The following sections will provide a detailed description of how we executed these steps.

4.2 Explore - Concept mapping

At this phase, the basic theme of the item was defined as an enchanted object that supports the users in relaxation. The goal of the first divergent phase of the design process was to explore this theme and understand which objects, activities, environments and feelings link to relaxation in people's everyday lives. Another goal was to generate ideas for future product design by identifying the logical connections between the concepts around relaxation.

To achieve this goal we utilized a divergent method called *Concept mapping* [24]. This method is used in user experience design to generate creative ideas and identify the connections between them. It is also a practical method to find structures and/or clusters in a set of concepts, that can support the designers in understanding options and logically approaching the given problem.

In this specific case, the concepts were collected through association. The starting point was the word "Relaxation". We collected ideas that linked to this theme without focusing on the product to design. This step can be interpreted as the exploration of the different layers of relaxation and how this relates to feelings, objects, and environments.

The ideas were collected on physical post-it notes and then became the nodes of our concept map. We created the digital twin of the post-its in the board in Figma, and identified the relations between the concepts. As we explored the topic and how the ideas link together, we also created clusters of ideas and identified patterns as well.

The main product of this method was a concept map including all the collected concepts and the relation between them. Additionally, we produced three visual representations of our concept: one where the nodes are unsorted, one that is focused on the physical and emotional needs of relaxation, and one based on categories within the collected concepts. These figures can be found in Appendix A.

4.3 Define - Design Synthesis

After the exploration of relaxation from various aspects, we had a better understanding of our chosen theme. The next goal of ours was to generate multiple design ideas and then choose one to further develop. We used design synthesis that is a hybrid method with a divergent and a convergent component. First, the team had to come up with insights and design patterns and then combine these to create design ideas. In the second part, these design ideas are evaluated based on novelty and feasibility.

An insight is a statement about human behaviour that is often based on observations and intuitions rather than proven facts. The insights listed by the team were all inspired by the previously created concept map. More specifically they highlighted how human environments affect emotions and how relaxation can be induced by different objects or activities.

A design pattern offers a solution strategy for addressing issues across various situations. The ten design patterns collected in this process included several novel technologies, tools and concepts such as artificial intelligence, social media, gamification or E-readers. The complete list of insights and design patterns used in this design synthesis can be viewed in Appendix B.

The aforementioned insights and design patterns were paired randomly and were used to generate design ideas. We created 16 design ideas and then plotted them on a coordinate system. On this system, the x-axis represented how feasible each idea was, while the y-axis showed how novel each idea was. The design ideas can be viewed in Appendix B.

There were multiple ideas in the positively novel and feasible quarter of the coordinate system, so we made the final decision by introducing a third axis for enchantment factor. Again, according to the Cambridge English Dictionary, enchantment is "a feeling of great pleasure and attraction, especially because something is very beautiful" or "something that is thought to have magical power over someone" [1]. Based on these definitions we opted for an enchanted bookmark as our enchanted everyday object to design. In addition, we also concluded that the two most important functions of the product will serve the purpose of motivating the user to spend as much time as possible reading:

- Show progress of reading compared to preset goals
- Introduce a social factor into reading by creating reading buddies to read with

4.4 Understand - Personas, Scenarios, Storyboards and Customer Journey Maps

Having defined the main object and features, the goal of the next step was to explore user needs. To achieve this we conducted interviews, created user personas and scenarios, drew storyboards, and identified possible user emotions and reactions with customer journey maps.

First, we conducted unstructured interviews with convenience sampling where we introduced the idea of the new object and asked the interviewees about their opinions, suggestions and development ideas. Some of the learnings from the interviews that guided us in developing the feature set of the bookmark:

- "I think tree and natural patterns are enchanting.", "I like organics shapes better than rectangular"
- "I want to avoid screens, this is why I read a book. So don't give me a screen on the bookmark.", "Screen is less enchanting"
- "Be careful with weight and thickness", "Don't make it bigger than a credit card"
- "I like rubber bands since they are practical to put on"
- "Lights can make the experience more enchanting"
- "Haptic feedback cool idea, could be repeated because you might not notice it the first time, just like the light or the notification"

When we were writing our user personas we focused on how our users could benefit from the imagined features. We wanted to create a bookmark that motivates users who struggle with finding time and motivation to read, and also improves the reading-experience of frequent readers. Therefore, one of the user personas (Paige) is

someone who does not like to read, but would like to start, and the other person (Mark) is a reading enthusiast (Appendix C).

The scenarios in which the two personas would likely use the enchanted bookmark, show a variety of environments and motivations to read. These scenarios can be used to model how users interact with the product. The subsequent steps of using the bookmark, the induced feelings and the development opportunities to avoid the expected negative emotions are summarized by the customer journey maps in Appendix D. The last components produced in this divergent phase were the story boards (Appendix E). With the help of these tools, we were able to understand what our users are looking for in such a bookmark and what are the things that can make the product frustrating and difficult to use. We collected the possible product features, which we narrowed down during the design of the low fidelity prototype.

4.5 Focus - Low fidelity prototype

The creation of the low-fidelity prototype consisted of the following steps starting with taking all the feature options that emerged during the previous phase where we understood the main user needs. The initial stage in developing the low-fidelity prototype involved identifying the core features of the product. Based on the conducted interviews and the customer journey maps we found out that the previously planned two main functions are something users would be interested in: tracking reading time progress and connecting with reading buddies.

Next, we decided which of the additional functions should be part of the product. During the user interviews we offered the interviewees some optional features, for example push notification if they still need to read to reach their preset goal or viewing a leader board among there friends. In addition to these they also added ideas to the list of optional features for example using the bookmark as a liner to support reading and make it possible to add multiple reading buddies. Our evaluation took into account various viewpoints. First, we assessed the number of prospective users who liked or disliked the proposed feature based on interviews. Next, we carefully considered any negative emotions the features might provoke. For instance, while one interviewee appreciated the leaderboard concept, others expressed a desire to read for enjoyment without the pressure of competition. Given the idea of relaxation in mind, we opted to eliminate any features that could induce negative feelings. Specifically, we decided against including the leaderboard feature.

The selected features are the following:

- A line of LED-s indicating the time that the user spent readying relative to their preset goal.
- A bendable top part for the product to function as a physical bookmark and to be able to hide the long part of the bookmark, when the book is taken away in a bag.
- A LED to show if one or more reading buddies are currently reading.
- A haptic feedback to let the user know when their buddy has started reading as well.
- A mobile app where the user can view the read books, connect their account to reading buddies accounts and view their progress.

Having determined the features we wanted to include in our product, we formed teams and created three possible designs. The design that was compatible with all of our desired features was one consisting of a back-plate, a box for storing batteries and the computing unit of the bookmark, a top part with artwork on it, a bendable spine that connects the top part with the back-plate, and a strap to attach the bookmark to the book.

In the next steps we identified the materials that we used for the low fidelity prototype and the pattern we would like to have on the bookmark to maximize the enchanting effect. For the back-plate, the box and the top part we ended up using cardboard paper. The two parts are connected with short pieces of wire covered by tape. The whole bookmark can be attached to the book by a piece of textile ribbon that uses two copper rings as a buckle.

In developing the artwork, we explored three design options inspired by our research on enchantment [1]. These options were: a rose garden, tendrils, and an enchanted tree theme (Figure 2). Our choice ultimately fell on the enchanted tree design for several compelling reasons. Firstly, the tree's trunk offers a solid foundation to support the product's digital components. Secondly, the tree design contributes to a magical effect as often associated with a magical tree/forest in pop culture, aligning perfectly with our theme. Additionally, the LED lights can be discreetly placed behind the leaves, enhancing the mystical effect. Moreover, the design incorporates a window feature that allows us to signify when "someone is home," metaphorically indicating that the reading buddies are engaged in reading. This choice effectively merges aesthetic appeal with functional storytelling, embodying the spirit of enchantment we aimed to capture.

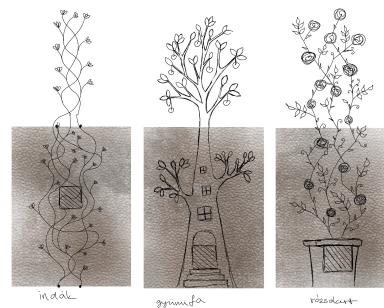


Figure 2: The three main considered options for the artwork

The refinement of the artwork and the main structure happened in parallel, and we were able to create all the planned parts according to the initial designs (Figure 3).

4.6 Develop - High fidelity prototype

The focus of the final divergent stage was on finding the best materials and the most practical solutions for our high-fidelity prototype. First, we created a list of the materials that we needed to order since some of the required parts were not already at hand. After receiving all the required materials, the development of the digital engine, the casing, and the artwork happened simultaneously. To achieve a cohesive and well-functioning product, we found that communication between the people working on different parts is crucial and



Figure 3: The final low-fidelity prototype

that all the development stages require multiple iterations to reach the best result.

The bookmark's casing is designed to encase the inner electronic components, while also offering an attractive and magical appearance. Compared to the initial low-fidelity prototype, the final version has undergone changes in material, shape, and design pattern. We opted for 3D printing, which meant the material choice was limited to what the printer could accommodate. Using Tinkercad, we developed several designs, evaluating them for their effectiveness in concealing the engine's components and their alignment with the "enchanted tree" theme (Figure 4). The chosen design deviates from a simple box shape; instead, it resembles an entire tree trunk to simulate a more organic aesthetic, while also offering more space than the small box in the preliminary prototype. Aesthetically, we preserved the original concept of a tree trunk with a door, omitting extra branches and windows after feedback indicated that the bookmark's size and durability significantly impact user experience.

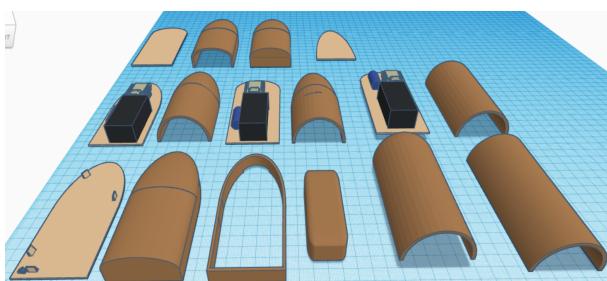


Figure 4: Design experiments for the case

The main details of the bookmark construction shall be discussed in section 5.

The main artwork of "the tree" was specifically designed to complement the LED placement. Drawing on our research into enchantment—where surprise or supernatural elements can create a magical effect—we chose blue and purple for the tree, adding a door and window to achieve a natural yet mystical appearance. The final prototype, illustrated in Figure 5, shows all the elements and the fully built version of the high-fidelity prototype.



Figure 5: The final high-fidelity prototype

4.7 Validate - User research

The final stage of the utilized triple diamond design method was the evaluation of our prototype. The evaluation process is described in detail in Sections 6 and 7.

5 IMPLEMENTATION

5.1 Hardware

For the device to function as intended, it is designed in three main parts:

Bookmark: The actual bookmark part of the device is the part that facilitates most of the user interaction as it displays the tree artwork to the user, beneath which lie the LED lights¹

¹LED: <https://www.tinytronics.nl/en/lighting/led-strips/led-strips/ws2812b-digital-5050-rgb-led-strip-60-leds-1m>

that communicate one's progress and friend activity. This part also contains a light sensor that is used to determine whether a user is reading; when the bookmark is folded up, indicating that they are reading, or when the bookmark is folded in between the pages, indicating the opposite. To maintain a traditional bookmark's function of fitting in between a book's pages, this part is designed to be as thin as possible. It is 3D-printed in one piece², the thickness of which is only limited by the thickness of the LED lights that need to be fit inside.

Spine: The aforementioned folding up and down of the bookmark is made possible by the spine. This part connects the bookmark part of the device to the computing and power unit and has the wiring for the LED lights and the light sensor running through it. The spine's property of being bendable, which allows for the bookmark to be folded up and down, while still being sturdy enough to hold up the bookmark while reading, comes from 3 pieces of copper wire running through it. These copper wires provide the structure integrity and flexibility needed for the bookmark to be able to both stand up and fold in between a book's pages at different length accordingly.



Figure 6: The electronics and wiring in all three parts of the device

Computing and power unit: As mentioned before, the spine connects the bookmark to the computing and power unit. The most important part of this unit is the Beetle microcontroller³, as this is the brain of the system that runs the Arduino code mentioned in Section 5.2.1. The Beetle has a wired connection to all of the system's sensors and actuators, as well as Bluetooth capabilities to communicate with external devices that run the application. Besides the

²All of the mentioned code and 3D-models are available on <https://github.com/MinhTran12/book-buddy>

³DFRobot Beetle ESP32-C3: <https://www.tinytronics.nl/en/development-boards/microcontroller-boards/with-wi-fi/dfrobot-beetle-esp32-c3>

microcontroller, the power and computing unit contains a vibration motor to facilitate haptic, a battery pack with two AAA-batteries to power the system, and a capacitor and resistors to manage the electrical circuit. The electronics and wiring are shown in Figure 6. The power and computing unit is contained in a 3D-printed housing² that can be attached to the back of the book. The housing is printed in two parts; a base plate on which the electronics and spine are attached, and a shell that covers all electronics on the base plate. The base plate and shell are attached to one another using magnets, allowing for the electronics to be easily accessible. To be able to be attached to a book, a ribbon with an O-ring buckle is glued to the base plate. The ribbon with such configuration can be lengthened and shortened to accommodate different book sizes.

5.2 Software

5.2.1 Arduino Code. The Arduino script builds the main functionalities of the bookmark like progress tracking and friend notifications during reading sessions. The script can be generalized into the following main divisions:

Initialization: The Arduino script begins by including necessary libraries such as Adafruit NeoPixel for controlling the LED strip, Timer for timing functionalities, and libraries for Bluetooth communication. It defines various constants such as Universally Unique Identifiers UUIDs for Bluetooth Low Energy (BLE) service and characteristics, as well as pin numbers for the NeoPixel LEDs and the vibrator. Additionally, certain variables were defined for managing LED status, reading progress, time goals, and debug information.

It should be noted that the UUIDs are what allow the communication between the device and the application, and for our current implementation we are using Version 4 UUID.

BLE Setup: The script initializes the BLE device, creates a BLE server, and sets up service characteristics for data exchange. These characteristics facilitate communication between devices, allowing for notifications of reading progress and receiving commands related to time goals and friend reading notifications. Callback functions are defined to handle events like connection, disconnection, and data reception.

Some other functions are implemented to handle data received over BLE, processing incoming data to adjust settings like time goals and friend reading notifications. Specifically, the script listens for data on two characteristics: one for setting the time goal and another for receiving notifications about a friend's reading status. For the former, upon receiving a new time, the device resets all LEDs and modifies the time it takes for each light to be turned on. For the latter, the script shall trigger the vibrator as well as a specific LED in response to the friend reading status.

Main Loop: The main loop of the Arduino code monitors the light sensor input to determine whether the bookmark is in use; it is dark for a certain value range, meaning the book is closed, and thus the bookmark is not in use, and vice versa. It controls the LEDs based on reading progress and ambient light conditions, communicating with connected

devices over BLE to send updates to and receive commands from the connected application. The updates includes data such as reading progress and reading status notification.

5.2.2 Application Code. The application is made using Javascript with the React framework and PureCSS library for simple styling. All packages and libraries that are not native are managed by Node Package Manager (npm). For the demo, only the Login page and the Landing page are implemented, with the latter containing all the core features necessary to demonstrate the device's capability. That includes displaying the user's reading progress, changing reading status of a friend, and sending to and receiving data from the connected bookmark. Visual wise, the application is minimal, displaying lists of books and friends, and the reading progress of the user. The main page can refered to Figure 9 in the appendix.

Communication between the device and the application is handled by the Web Bluetooth API for the latter, but it should be noted that the API does not work with every existing browser. At the time of writing, we suggest using Google Chrome to fully utilize the API's provided features, but some other browsers should also be compatible, such as Edge and Opera. The library itself is built-in, and thus does not need to be installed externally. The UUIDs defined in the Arduino code shall be used in the web app code to initialize the communication.

6 USER STUDY I: SURVEY

In the next step of our design process, we conducted an experimental vignette study with the low-fidelity prototype. This pragmatic approach has been used in past work on designing prototypes for HCI [4, 5]. It allowed us to evaluate our prototype already at an early stage, which ensured a continued user-centered design process. The aim of this study was to evaluate what impact using our bookmark and app would have on users' feeling of social connectedness and motivation to read. Additionally, we wanted to examine whether our product would feel enchanting to users. Employing a within-subjects design, we compared participants' usual book reading experience to the imagined book reading experience using our bookmark based on two vignettes. We did this by acquiring data about the usual book reading experience (the "baseline" to compare our prototype to) first. Participants were first asked about their usual reading experience without giving them any information about our product. Then, we introduced them to our product and the vignettes and had them answer questions based on the imagined use of our product in the end.

6.1 Participants

We recruited N = 13 participants through convenience sample of peers, friends, and family. Our sample included 6 male, 5 female, and 2 non-binary participants (N = 13), from 23 to 57 years old (Mdn = 24.5). The participants took part on a voluntary basis.

For the analysis, participants were categorized into two distinct user groups based on their reported reading frequency. The first user group represented individuals with high levels of existing reading engagement. This consisted of participants who indicated reading habits of "once a week," (one participant), "several times a week," (two participants) or "daily" (two participants). We refer to this user group as "reader" in the following. In contrast, the second group

comprised participants with less frequent reading habits, including those who read "a few times a month" (one participant), "once a month or less" (five participants), and "never" (two participants). We refer to this user group as "non-reader". Notably, the participants who "never" read were excluded from further analysis concerning reading behavior. Among the participants, a common aspiration to read more was evident, with 11 out of 13 expressing a desire to read more often.

Of the eleven participants included in the analysis of reading behavior, the majority read "30 minutes to one hour" (55%), 4 participants said they usually read from "15 to 30 minutes" (36%) and only one participant read for "more than one hour" (9%). Additionally, three of the eleven participants, stated to use an E-book to read, while the others all preferred to read physical books. Lastly, most of the participants who read physical books stated to always use a bookmark and a few outliers only "sometimes".

6.2 Survey content

The QualtricsXM survey software was used to create an online survey. The survey took approximately 18 minutes to complete. It started with gathering demographic data and assessing the participants' reading habits. Participants were asked how much they read, for how long, and which medium (e-book or print book) they preferred to identify different user groups and examine the differences between them. Print-book readers were also asked whether they use a bookmark.

The second phase of the survey involved assessing participants' levels of enchantment, motivation, and connectedness during their usual reading experiences. These measurements would serve as a baseline against which we could compare the imagined reading experience with our bookmark, based on the vignette scenarios provided later. Importantly, individuals who indicated that they never read were excluded from these baseline questions, as they lacked the necessary experience to provide valid responses.

During this phase, participants were asked to give their personal definitions of enchantment to provide us with a better picture of their perceptions of the concept we were measuring. They then rated the enchantment of their usual reading experiences on a 4-point scale, ranging from "not enchanting at all" to "very enchanting." Additionally, we employed the Enchantment Adjectives Checklist Measure by Houran et al. [12] which was used to assess participants' perceptions of enchantment during their reading experiences. Participants could indicate which enchantment-related adjectives they would use to describe their reading experiences. The more adjectives selected, the more enchanting the experience is considered to be. Adjectives such as "delighted," "lost in the moment," and "inspired" were included in the checklist.

Next, participants were prompted with the question: "Please rate the social aspect of reading books. Do you usually feel connected to your friends/family while reading?" Responses were provided on a 4-point scale ranging from "not at all" to "very connected." This query served as the baseline for participants' perceptions of social connectedness during their typical reading experiences. In contrast, when assessing social connectedness during the imagined reading experience with our bookmark prototype, we utilized the Social Connectedness Scale developed by Lee et al. [15].

After establishing the baseline measurements, participants were introduced to our product for the first time. They received a detailed description outlining the functionalities of both the product and the accompanying app. Following this introduction, participants were presented with vignette scenarios accompanied by pictures of the low-fidelity prototype and wireframes of the app. By providing visual cues, we aimed to elicit more vivid and insightful responses regarding their perception of the bookmark's features and its integration into their reading habits.

To enhance participant focus and immersion in the scenarios, we intentionally separated the parts for the app and the bookmark. This approach allowed participants to focus on imagining the use of one component at a time. The scenarios can be found in Appendix F.

The first scenario, which focused on the app, transported participants to a setting in their living room, inviting them to envision their interaction with a novel reading tool. As they settled into their favorite armchair, participants were prompted to explore the app's features, set up their reading goals, and add books and friends to their profile. Subsequently, wire-frames of the app were presented which were intended to help participants visualize the product and align responses with a consistent mental image across participants.

Following this, participants engaged in the second scenario in which they envisioned themselves taking a moment to enjoy their tea with their favorite book ready for reading, equipped with the bookmark attached to its back. As they delved into their reading, they observed the tree-shaped indicator lighting up gradually, symbolizing progress. Additionally, they experienced haptic feedback as their book vibrated, indicating their friend's engagement in reading.

In the last part of the study we aimed to evaluate users' feeling of motivation, connectedness and enchantment in the imagined use of the bookmark. We first asked them whether they believed that utilizing the bookmark would influence their ability to adhere to their reading goals. Participants responded with "yes," "no," or "maybe," and elaborated on their answer. Following this, participants were shown a list of aspects of the bookmark and the app that could potentially help them stay motivated to achieve their reading goals, for instance, "Setting my own reading time goals and seeing my progress in the app". They were given the opportunity to check off those aspects they found relevant and also had the option to add additional elements they believed would be motivating but were not listed. This approach aimed to uncover the most effective motivational factors and determine potential differences between user groups.

Participants re-evaluated their level of enchantment using the previously described scale and completed the Enchantment Adjective Checklist Measure, now considering the imagined use of our bookmark.

Lastly, participants filled out the Social Connectedness Scale developed by Lee (1995) to quantify the feeling of connectedness they experienced during their imagined reading session [15]. Using a 6-point Likert scale, participants rated their agreement with statements such as "I feel close to people" and "I find myself involved in peoples' lives," as well as negatively worded items like "I see myself as a loner."

6.3 Data analysis

We used IBM SPSS Statistics Version 29 to analyze the quantitative survey data. For the open questions, answers were color graded based on similarity. The open questions were analyzed and any matches between participants were explored. Lastly, the closed questions were first analyzed quantitatively, and later put into context using the answers to the open questions.

6.4 Results

6.4.1 Enchantment. A paired-sample t-test was conducted to compare the mean scores on the enchantment scale for the usual book reading experience and the imagined book reading experience using our bookmark. The results revealed that there was no statistically significant difference between enchantment levels for the usual reading experience ($M = 2.73$, $SD = 1.00$) and the reading experience using our bookmark ($M = 3.18$, $SD = 0.60$, $t(10) = -1.83$, $p = 0.096$). While the paired-samples t-test did not reveal a statistically significant difference in enchantment levels for a significance level of $p = .05$, we can still notice that the result would be significant for a significance level of $p = 0.10$, which might be a sufficient significance level given the small sample size of 13 participants. It is worth noting that there was a slight increase in enchantment scores observed in the sample between the two values.

To compare the mean raw scores on the enchantment adjective checklist measure between participants' usual book reading experience and their imagined book reading experience using our bookmark we conducted a paired-samples t-test. The analysis showed no statistically significant difference in enchantment levels between the two conditions ($t(11) = -1.31$, $p = .219$). Despite the lack of statistical significance, it is noteworthy that participants reported slightly higher enchantment scores when imagining the book reading experience using our bookmark ($M = 7.27$, $SD = 3.84$) compared to their usual reading experience ($M = 6.36$, $SD = 3.50$).

As the checklist comprises various adjectives associated with enchantment, we performed another analysis comparing how frequently participants ticked each adjective in both contexts because we wanted to understand which factors exactly characterized the users' feeling of enchantment. For each adjective, we counted the number of ticks in both contexts separately. With a sample size of 13 participants, the maximum frequency for each adjective was 13, as this meant that every participant selected that particular adjective. Conversely, the minimum frequency for each adjective was 0, indicating that none of the participants selected that adjective. Notably, the use of our bookmark prototype appeared to evoke greater feelings of inspiration and fulfillment among participants. While "inspired" was endorsed by 5 participants in their usual reading experiences, this increased to 8 when imagining their reading experience with our bookmark. Similarly, feelings of fulfillment saw a significant increase, with only 1 participant endorsing it in their usual reading experiences compared to 8 participants when imagining their reading experience with our bookmark. These findings suggest that our prototype has the potential to enhance participants' emotional and psychological engagement with the reading material and foster a more enriching reading experience.

In their usual reading experiences, participants reported experiencing joy (5), excitement (3), and delight (4) to rather low degrees

(see Figure 7). However, when imagining their reading experience with our bookmark, these feelings were notably heightened, with joy being endorsed by 7 participants, excitement by 7 participants, and delight by 8 participants (Figure 8). This indicates that our bookmark potentially contributes to the reinforcement of positive affect while reading. While participants often reported feeling "lost in the moment" during their usual reading experiences (6), this sensation was less when imagining their reading experience with our bookmark prototype (2). We consider this to be due to the fact that our bookmark is designed to help users keep track of their reading goals. The lights in the tree indicate how long the user has been reading, so they inevitably become more aware of time when reading, which reduces their immersion in the moment. Moreover, participants consistently endorsed the adjective "connected" at similar levels across both reading contexts. This indicates a consistent perception of social connectedness during reading, irrespective of the use of our bookmark.

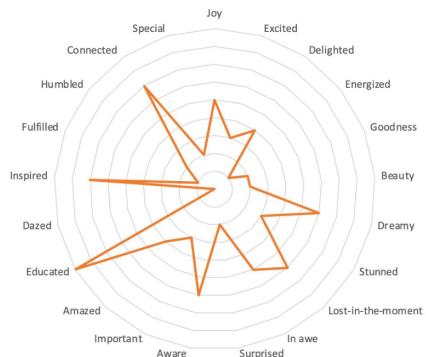


Figure 7: The enchantment Adjective Scale for the usual reading experience



Figure 8: The enchantment Adjective Scale for the imagined reading experience using the bookmark

6.4.2 Connectedness. The Social Connectedness Scale by Lee et al. [15] was utilized to assess participants' perceived connectedness during the imagined use of the bookmark prototype. The analysis

was conducted following the procedure outlined by Lee et al. [15]. After reverse coding, the summed scores for each participant were calculated by combining the reverse-coded items with positively worded items. This resulted in a scale score ranging from 20 to 120, where higher scores indicated a heightened sense of social connectedness. The average scale score across all participants was 85.2 ($SD = 10.62$). This average score suggests a notably strong perceived social connectedness among participants when envisioning the use of the bookmark prototype in their reading experiences.

Due to an error in the survey settings, the connectedness baseline question about participants' typical book-reading experiences was not displayed to any participants. Consequently, we lack a baseline measurement of connectedness for participants' usual reading contexts. Therefore, direct comparisons between the perceived social connectedness facilitated by the bookmark prototype and participants' typical reading experiences could not be made.

6.4.3 Motivation. The participants varied in their motivation levels regarding reading while using the bookmark. Some were already content with their reading experience and stated they would not need an enchanted bookmark, although it would be a "*nice extra*", while others sought additional incentives or tools to enhance their reading experience. This division correlated with the two target groups of our bookmark; frequent readers mainly saw this as an addition, not a necessity, while the group who read less was glad to have this motivational aspect.

Several participants mentioned that tracking progress or achieving reading goals provides them with a sense of accomplishment and progress, which can be motivating. For example, when asked which of the features they liked (multiple options were possible); "*Setting my own reading time goals and seeing my progress through the tree lights*" was by far the most popular (77%). Additionally, "*Setting my own reading time goals and seeing my progress in the app*" was also one of the favorite features of many (62%). "*Seeing what my friends are reading in the app*" was also picked a few times (46%). Having their own digital bookshelf in the app (54%), had some high interest, indicating that users appreciate having a personalized space to organize their reading materials within the app. The least picked feature was "*[Sensing] when friends are reading through haptic feedback*" (23%). This feature has the lowest level of interest among participants, suggesting that haptic feedback related to friends' reading activity may not be a significant motivator.

6.5 Interpretation

The target audience could be divided into two groups: one that read less (but desired to read more) and another that already reads extensively. Recognizing that both groups had distinct experiences with the bookmark and focused on different features, it was crucial to conduct further qualitative research, to get detailed insights into both user groups. To be specific, frequent readers may view the bookmark as an optional addition to their reading experience, while non-readers seeking to read more, may see it as a valuable tool for engagement. At the same time, participants seem to value goal-tracking functionality the most as a way of increasing reading motivation, while the social aspect lacks support.

7 USER STUDY II: OBSERVATION & INTERVIEWS

Having observed that there are two user groups, readers and non-readers, that differ in their user requirements and perceptions of the three factors enchantment, motivation and connectedness, we wanted to get a better insight into the two specific user groups. In a short observation and following semi-structured interviews we explore the user experience and users' thoughts regarding the three themes.

7.1 Procedure

The session started with basic demographic data collection and obtaining consent for taking part in the experiment as well as being recorded. T

The first phase began - the observation; the participants were presented with the prototype, the associated app in a desktop version and a book and were given the task of exploring what they could do with it and saying out loud what they thought. We did not give the participants any detailed information about the product at first, to avoid influencing their first impressions and to observe the user-friendliness as naturally as possible. During the observation, one researcher took notes on the person's behavior and recorded an audio of what was said. Another researcher was stationed to help the participant with the use of the desktop app and the prototype without being too direct. After five minutes, we asked the participant what they thought the prototype's functions were. We then explained all the functions and demonstrated them on the prototype and in the app. This was followed by the semi-structured interview, which was also audio recorded. One question was asked about each of the three objectives, as well as two final general questions in order to be able to make a direct comparison with the usual reading experience:

- **General:** Overall, How do you feel about using the bookmark compared to your usual reading experience with a traditional bookmark?
- **Motivation:** Do you believe that using the bookmark would positively influence your ability to follow through with your reading goals over an extended period? If so, why? If not, why not?
- **Enchantment:** Can you recall any instances while using the lo-fi prototype bookmark where you experienced a sense of wonder or delight? If yes, what elicited those emotions?
- **Connectedness:** How do you think the friend function of the bookmark impacts your reading behavior (in terms of the social aspect of reading or your motivation) compared to using a traditional bookmark?
- **General:** Overall, would you consider using the bookmark as your primary bookmark over a traditional bookmark? Why or why not?

7.2 Data analysis

Concerning the interviews, there was a total of 2 participants (N = 2). One female reader of 24 years old and another female non-reader of 24. Later, a male, 23-year old reader joined the interview of the non-reader. The interviews were transcribed and analyzed using color coding.

7.3 Results

7.3.1 Usability. During the readers' interaction with the prototype bookmark and the app, they initially seemed intrigued by the physical aspects of the bookmark. They noted its "interesting shape" and the lights that illuminated sequentially at the top. This indicates that the visual and tactile elements of the prototype were engaging and caught the participant's attention.

When the participants interacted with the accompanying app, they were curious about which functions it would trigger in the bookmark. When one participant triggered the "a friend starts to read" function, they questioned whether the vibration would cease when the bookmark was set down. The participant also demonstrated an understanding of the connection between the lights on the bookmark and their reading goals: "*Oh it's two lights now, it fills the reading tree... and when all the lights are on your reading goal is reached!*". This indicates comprehension of the device's intended purpose without the need for explanation. There was some confusion regarding how the bookmark should be attached to the book, as all participants initially attempted to insert the entire bookmark into the book. However, after receiving guidance, they adjusted their approach. This suggests that clearer instructions or visual cues may be necessary to convey the proper usage of the bookmark. The reader participant positively noted the design of the bookmark by saying "*I do think it's kinda cute. It has a little door on in which I think is cute*". Specifically, they expressed appreciation for certain features of the bookmark, such as its flexibility ("*I do like the concept of a bookmark that folds over the book instead of just in the book because it is a bit more sturdy*") and the visual effects ("*it is fun to see the lights*"). This feedback indicates potential satisfaction, especially with those aspects of the prototype's design that had been heavily influenced by user feedback during the design process already.

The non-reader initially expressed uncertainty regarding the purpose of the device, for example, they said: "*I don't know what it does*". However, as the session progressed, they actively explored its features and capabilities. The participant immediately mentioned "*it seems to me like a magical stick*", pointing out the enchantment aspect of the prototype. Also, adding to this, they mentioned that "*it seems like something that you keep in your hands*". After a bit more explanation, the participant figured out it was a bookmark. In the beginning, they had some issues understanding what it was, however once they did they were very enchanted by the idea of it. The non-reader said: "*I had some issues in understanding what it was. But also because it's something so new, like so different. Because when you think about bookmark, of course, you don't think about something like this. [...] I was very surprised, like in a positive way. Something completely out of my imagination.*". The participant first did not understand the effect of the timer and the lights, first thinking it portrayed the amount of words you could read in X amount of seconds or minutes. After explaining it represents a reading goal, the participant noticed the shape of the tree for the first time. The participant said: "*Some lights are appearing. Yeah. And it's a tree. Okay... And this is the reading goal. So you can put the number that you want and until what number can you reach?*". It was not immediately clear to the participant what the purpose of the timer was. After explaining it was to set a reading goal, the participant

expressed her enthusiasm by sharing she would want one as well; *"Oh, this is actually very cool. I would want this, because I always stop before reaching my goal."*

7.3.2 Enchantment. When the reader recalled moments of wonder and delight experienced while using the prototype, they particularly enjoyed the sensation of the light turning on when their friend was also reading, describing it as "fun" and emphasizing the feeling of sharing an enjoyable activity. This response suggests that the interaction with the bookmark created a moment of enchantment by adding a playful and social element to reading. Furthermore, when asked if they found the bookmark enchanting, the participant responded affirmatively, saying *"Yes, in an ideal situation [with a finished product], absolutely!"*. They suggested that incorporating soft colors and sparkling lights could further enhance it. This response reaffirms the participant's perception of the bookmark as a source of enchantment, which might not fully be the case yet, but has great potential, especially highlighting the importance of aesthetics and sensory appeal in creating a magical reading experience.

During the exploratory observation, the non-reader had some issues understanding what the product was, however once they did they were very enchanted by the idea of it. They mentioned the prototype looked "like a magical stick", pointing out the enchantment aspect of the prototype. later, they added *"I was very surprised, like in a positive way. Something completely out of my imagination."* This suggests that interacting with the prototype evoked a sense of, surprise, wonder and delight in the participant.

7.3.3 Connectedness. The reader participant liked the aspect of seeing when friends are reading in real-time. They expressed enthusiasm, stating, *"I do think it would be fun to see that when you're reading yourself, a friend is also."* Moreover, they appreciated the idea of subtle social cues, such as a light turning on in a tree-shaped, particularly. However, they expressed a preference for reading as a personal pursuit rather than a social activity, stating, *"I'm not always looking for interaction when I'm reading books because it is a very solitary activity."* This suggests that while they value independence in their reading, they still find enjoyment in sharing the reading experience with others in a non-intrusive manner.

The non-reader perceived the friend function as very innovative, mentioning *"I think this is very cool. ... And also, it's a very innovative idea, I think."* However, the same participant also expressed their doubts about the effectiveness of this feature: *"having a goal is definitely something that would motivate me. But I don't know about seeing a friend who is also reading, it could be very powerful. But I would need to try this, to be honest, because I'm not sure."*

7.3.4 Motivation. Regarding motivation, the reader emphasized the importance of maintaining the intrinsic enjoyment of reading. They shared their reading goal of completing 75 books in a year, highlighting their commitment to reading as a personal hobby. While they appreciated the idea of setting reading goals, they preferred to measure progress in terms of books read rather than time spent reading. This reflects their desire for autonomy and enjoyment in their reading practice, as they stated, *"I think reading is something that I make time for but I would not force myself to read with setting a time goal because I think it would take the fun out of it."*

The motivation aspect intrigued the non-reader. They had many questions and wanted to know more about this feature. For example whether the lights would switch off once you stopped reading. When explaining the lights remain on the same position once you stop reading and continue later that day, they were very enthusiastic. *"Yeah, but it's less likely to stop if you haven't completed your goal, right? It can be... I would be more motivated to read. Yeah, if I see that my lights are like here and I want them to... You know, like my goal has to be completed."*

8 DISCUSSION AND FUTURE WORK

Regarding user-friendliness, the participants provided feedback on practical features of the bookmark, such as setting timers or alerts to help manage reading sessions. They suggested that such features could be beneficial for readers who may have limited time for reading, ensuring they do not become overly absorbed in a book. Additionally, they recognized the appeal of the bookmark for individuals who appreciate aesthetically pleasing "bookish-items" and suggested that soft colors and sparkling lights would enhance its enchanting qualities. One of the concerns was the size of the bookmark, this could be an issue for smaller books or when reading somewhere else than at home. We achieved the smallest and lightest product possible within the limitations of the course but would advise future work to experiment with other materials and components to improve those aspects.

Because the absence of a baseline measurement of connectedness for participants' typical reading experiences limits our ability to measure the extent to which the bookmark diverges from traditional reading practices, the notably high average score on the Social Connectedness Scale underscores the potential of the bookmark to enhance readers' sense of connectedness during reading. The statements made by both user groups during the interviews support the notion that the friend feature may effectively foster a sense of connection among readers. Specifically, for the user group "reader", this function adds to their feeling of enchantment. For the "non-reader" user group, the friend feature seems to support the motivational features of the prototype. When a friend is reading, it might effectively motivate the user to also start reading and achieve their reading goals continuously. Further research should rectify the survey, including the Social Connectedness Scale before and after the vignette, to enable a better comparison between the bookmark and conventional reading practices.

While the paired-sample t-test did not yield a statistically significant difference in enchantment levels the slight increase in both enchantment scores indicates that the participants perceived our bookmark as more enchanting compared to their usual reading experience. Significant increases in user enchantment could potentially be found when reproducing the study with a bigger sample size. The users' enchantment was particularly characterized by joy, delight, and excitement. However, users felt less immersed in their imagined reading experience. The motivational features of the bookmark might overshadow the enchanting aspects of the bookmark. The lights indicating the duration of the user's reading session might lead to a heightened time awareness. Consequently, this time consciousness diminishes the user's immersion in the reading experience. As we have found the enchantment factor of

the bookmark to be especially important for the "reader" user group, it is important to find a balance between motivation and enchantment. Hence, future research could investigate alternative methods for the time indication, trying to mitigate the awareness of time during reading. These could be based on the haptic feedback. The bookmark could, for instance, vibrate with increasing strength, indicating reading progress over time.

Regarding the motivational features of the bookmark, setting personal reading time goals and tracking progress within the app emerged as effective features. Additionally, making reading a social experience by showing users when a friend is reading, aids in motivating them to also start reading. Interestingly, this feature was particularly valued by people who already read a lot, which suggests that the enchantment aspect of this feature can be interesting for people who do not need the motivational aspects. Notably, the visual representation of progress through tree lights stands out as the most motivating feature, emphasizing the importance of visual cues in motivating users. Enhancing the design of this feature in future research could improve user motivation for users who would like to read more and enchantment for users who are already motivated to read.

In summary, the results of our evaluation reflect the user-centered approach used in this project. We based the development of the bookmark on the goals and needs of two different personas. The results of the survey confirmed the existence of these two user groups and that the bookmark meets their requirements, at least to some extent. For occasional readers who wish to read more, it is important to be motivated through the bookmark and the app to achieve their reading goals, for instance by seeing their progress through the lights and in the app. These features are less important to users who already read a lot. For these users, it is more important that the bookmark incorporates fun features that can provide a magical addition to their reading experience, like the connecting function with haptic feedback and design. Motivational features are therefore beneficial, as they contribute to a positive evaluation of the bookmark by one user group but they come at the expense of enchantment, which scores highly with another user group. Hence, further user testing should strive to find a good balance between these two factors. In addition to enchanting and motivating, the bookmark also aims to connect people. It should be possible for a frequent reader to use the bookmark with their less frequent reading friend, and for both users, the use of the bookmark should provide equal added value to their reading experience. In future research, this can only be guaranteed by continuing the user-centered design approach, to cater equally to the needs of both user groups.

9 CONCLUSION

In this paper, the process of developing an enchanting bookmark is described, including the evaluation of the eventual product. Our goal was to create a bookmark that would make reading feel enchanting, motivate users to read more, and add a social aspect to the reading experience. This was done by letting users set a reading goal and visualizing their progress towards this goal while reading. Additionally, an enchanting design was created for the bookmark based on user feedback. A light that lights up when a friend is reading and a vibration motor that briefly vibrates when a friend

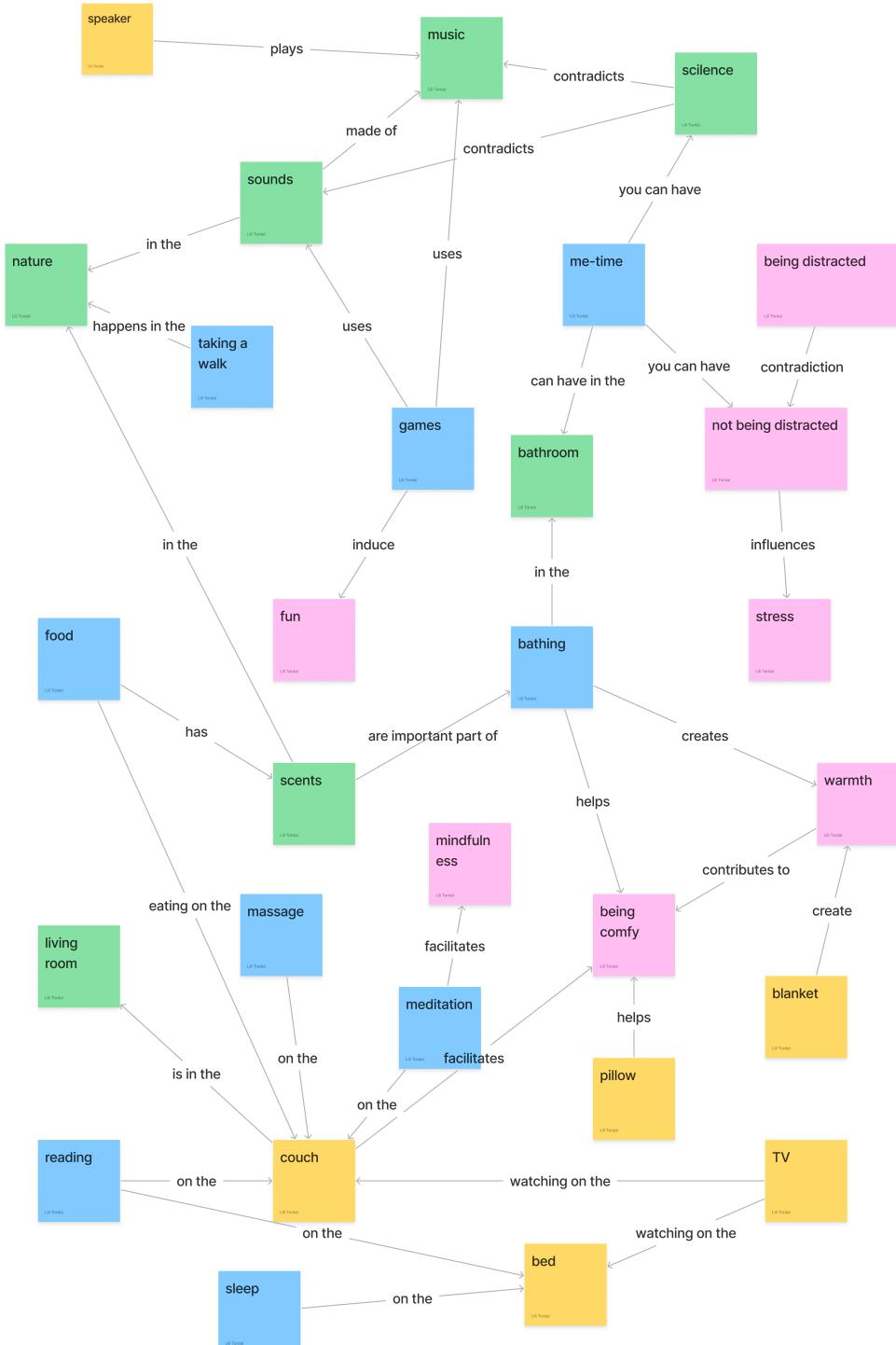
starts reading were added to increase social connectedness while reading.

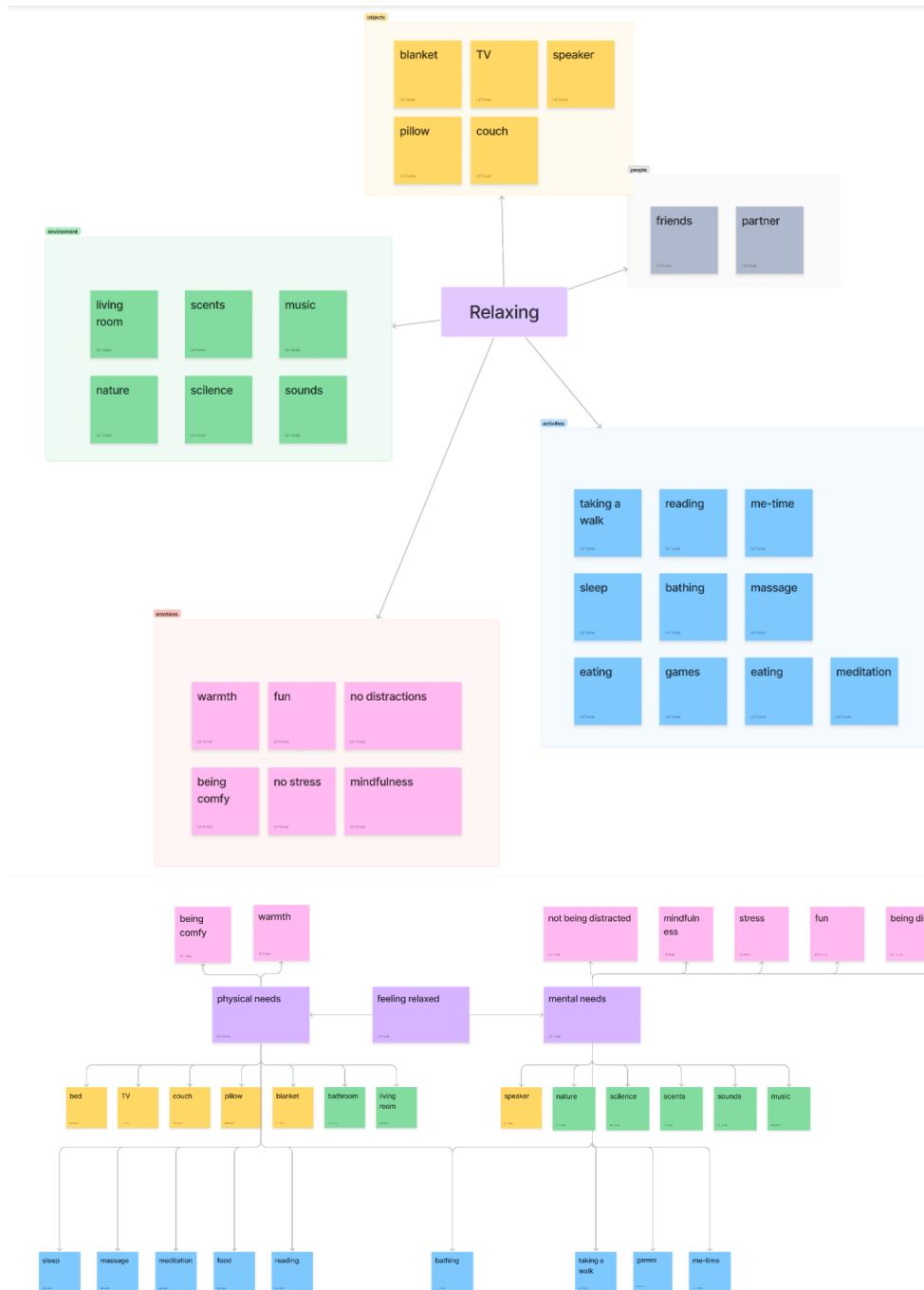
The creation of this product was done by using a triple diamond design which focuses on the process of diverging and converging. Throughout this process, the user had a central role. In each step, user feedback was collected to improve the design and to make sure the product would adhere to user requirements. Results of the low-fidelity prototype evaluation supported the initially anticipated division of users into two distinct groups; users who read frequently and users who do not read a lot yet but would want to read more. The non-readers mostly valued the features concerning the motivational aspect, while the readers focused especially on the enchanting and connecting aspects of the bookmark. The interviews with both user groups separately shed light on the bookmark overall succeeded in bringing enchantment, motivation, and connectedness to the reading experience. We advise future research to focus on the reader user group and investigate how the bookmark could be. Future research should, however, consider both user groups separately to create which were found to be its "magic tree" design and the haptic feedback when a friend starts to read.

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A CONCEPT MAPPING





B DESIGN SYNTHESIS

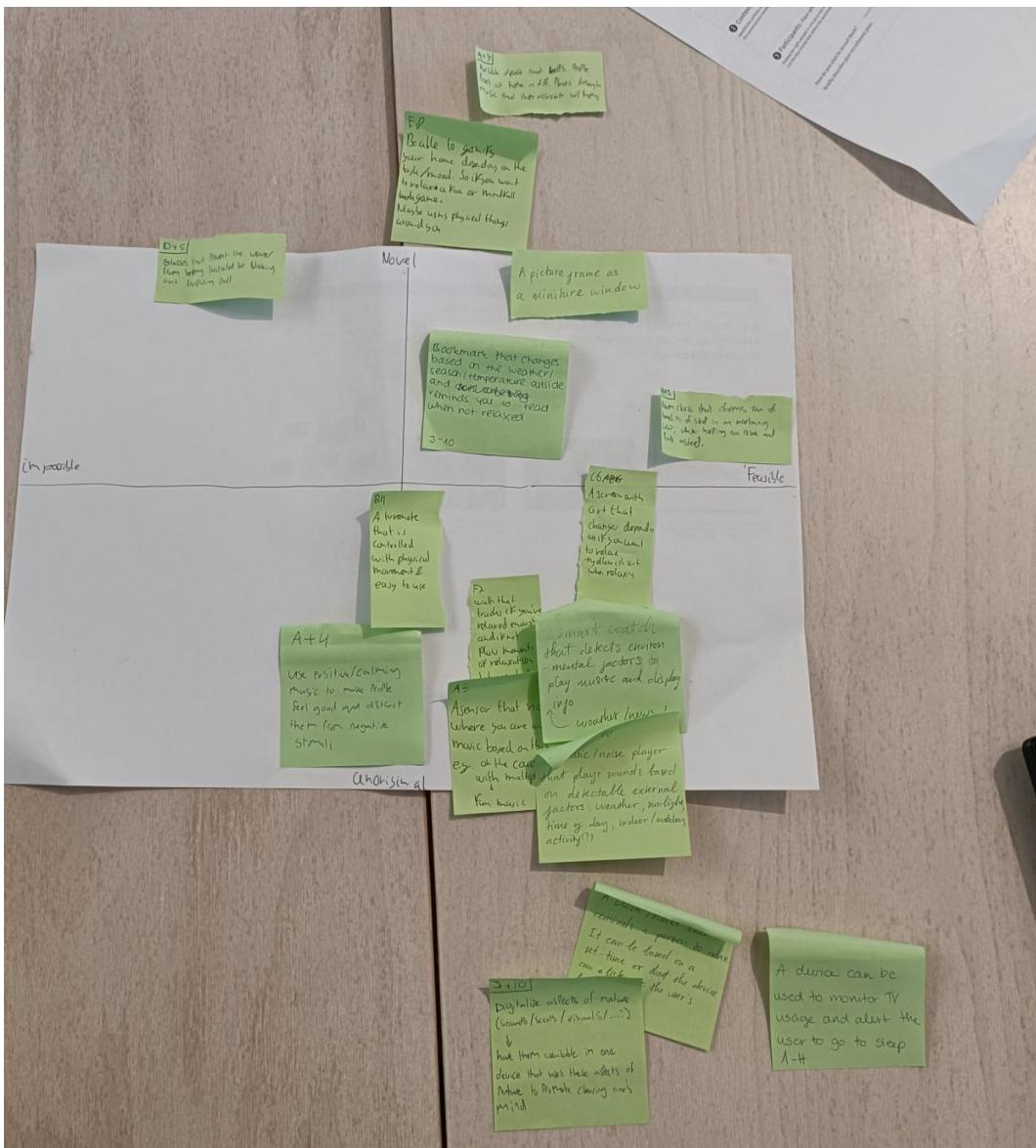
B.1 Insights

- (1) It is easier to relax when you had enough sleep
- (2) Human sensed are influenced by both internal and external factors
- (3) Creating a nice, aesthetic physical environment helps relaxing
- (4) Distracting your mind from negative stimuli helps calm down
- (5) Frustration stops relaxation
- (6) Changing form your day-to-day environment helps relaxing
- (7) Most people don't have more than one hour to relax daily
- (8) People relax intentionally
- (9) People feel comfortable and safe at home
- (10) Nature helps to clear your mind
- (11) Physical activity helps people relax

B.2 Design Patterns

- A Music can induce emotions
- B Simpler designed TV remotes are easier to use
- C Yellow toned light reduces stress, while blue induces stress
- D Glasses help people see
- E Gamification enhances user engagement
- F Smart watches help monitoring people's health
- G Social Media is used to connect with people over vast distance
- H TVs are made to entertain and inform people
- I AI helps content adoption to context
- J E-reader digitize and centralize multiple physical books (so one can take multiple books to physical places without carrying)

B.3 Evaluation of Design Ideas



C PERSONAS AND SCENARIOS

C.1 Persona: Mark Book



Mark Book
Government employee

Age: 49 years	Country: Netherlands
Sex: Male	Education: Master in Political Science
Relationship status: Married, two kids	Reads daily

BIOGRAPHY

Since his promotion last year, Mark's former office job in Den Haag now requires him to travel a lot. He spends hours on trains and planes and often stays away from home for several nights. His days are full of meetings and he is relieved when he finally finds some rest in his hotel room at the end of the day. He loves his job, but he finds all the traveling tough at times. He often misses his family a lot and would like to spend more time with his children. Just like his wife, he is passionate about reading, both to educate himself and to escape his busy everyday life. He used to take turns with her to read the children a bedtime story. Unfortunately, he can no longer continue this ritual due to his many business trips.

GOALS AND OBJECTIVES

- Feel more connected to family
- Relaxing
- Distracting from work and being alone while travelling

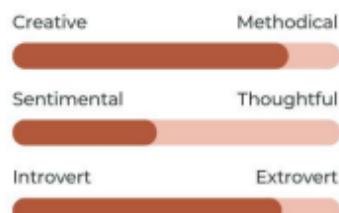
READING HABITS

Mark reads a lot while travelling. He also likes to read after a long day of work to relax and unwind. He tends to read every day when away from home and goes through one book a week. He reads both because he likes it and because he has to relax and keep himself from getting bored while travelling.

TYPES OF BOOK GENRES

- Science fiction
- Self help
- Biographies
- Political

PERSONALITY



SKILLS

Technology	
Reading	
Mindfulness	

C.2 Scenario: Mark Book

Context/ moments of usage - Mark

The first time Mark uses the system he installs the app on his phone and connects it to his bookmark. Additionally, he adds the book he is currently reading to the app. Since he mainly uses it to stay more connected to his family, he also adds his wife as a contact to the app. So, he will know when she is reading or when she is reading to their children.

The system will primarily be used while reading. Since it is a bookmark, it will be pressed together when not reading and when he opens the book it will light up. In the specific case of this persona, the system is mainly used when travelling.

Since Mark travels a lot for work, he reads a lot while in public transportation. When it's dark on the public transport the system offers a small amount of light which helps while reading. However, it can also annoy other travellers if they prefer a completely dark environment. Additionally, since the Wi-Fi connectivity while travelling is not always as reliable, so Mark will not receive all notifications when his family is reading.

While travelling Mark misses his family a lot, so he tries to stay connected with them as much as possible. By using the system, he knows when they are reading so he feels more connected to them. Now he knows when his wife is reading and relaxing and when the kids are getting ready for bed and are read their bedtime stories.

User goals (prioritized) - Mark

1. Feel more connected to his family

C.3 Persona: Paige Anouar

	<p>Paige Anouar Physics student</p>
Age: 20 years	Country: Netherlands
Sex: Female	Education: 2nd Year Bachelors
Relationship status: Single	Doesn't read a lot, but would like to read more

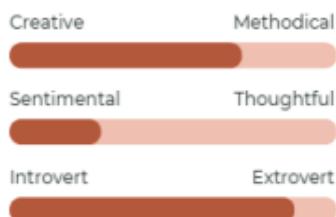
BIOGRAPHY

Paige is a 2nd year physics bachelor student, studying at Utrecht University. She was born and raised in the Netherlands, but she is of Egyptian origins and she speaks and reads Dutch, Arabic and English fluently.

She is studious and outgoing. She loves to have long discussions with her friends, but when it comes to talking about books she feels a bit left out. It's like she was less smart just because she read less books.

She loves to spend time outdoors and to exercise. She even tried to listen to audiobooks while running in the park, but she found out she prefers listening to music.

PERSONALITY



GOALS AND OBJECTIVES

- Expand your skills
 - Develop your personal brand
 - Set sales goals
 - buy a house

READING HABITS

She would like to start reading more books, especially related to scientific and educational topics. She lacks the motivation and the ability to concentrate on reading.

TYPES OF BOOK GENRES

- Scientific
 - Non-fiction
 - Would like to read more romantic novels.

SKILLS

Technology	★★★★★
Reading	★★★★★
Mindfulness	★★★★★

C.4 Scenario: Paige Anouar

Paige would prefer to read at home. Otherwise maybe in a cafe, train, or even in a park. Anywhere that she has some free time and can open her books.

She doesn't want the device to be disturbing for the people around them when they are in public spaces. For example, the device's lights, if there is any, should not be too bright. If there is a sound system, she doesn't want to be noisy in a public setting.

Paige will most likely buy the bookmark it in its packaging and then set it up herself. The bookmark has to be attached to the back of a book. She will also have to connect the bookmark to her phone and download the app for additional features.

Being able to connect with friends and have personal streaks could help Paige be more motivated to read more often (and for longer).

User Goals (prioritized) - Paige

1. She wants to be more motivated to start reading
2. She wants to feel less left out when her and her friends are talking about books
3. When she reads, she would like to be more focussed and read for longer periods of time
4. She would like to read in the different languages she speaks.

Scenarios – Paige

1. Paige is at a cafe having some free time on her hand. She sees that her bookmark inside a book she recently started is indicating that she has only spent 30 minutes reading total. Wanting to put more time to this, she picks up the book and continues where she left off. As she is reading, her concentration begins to falter. Yet when she sees that on the bookmark, there is a tree that is growing the further she reads, she becomes motivated again.
2. Paige is at home watching TikTok and her book is sitting on the coffee table besides her. She receives a phone notification saying, "your friend Anne continued reading XYZ book". This is the book they both started reading, so she decides to also read at the same time as her friend. In fact, she even calls up her friend to have a read-along session.

D CUSTOMER JOURNEY MAPS

Persona: Mark Book

Goal: Feel more connected to his family

ACTION	Mark adds the bookmark to the app on his phone	Mark adds personal information to the app	Marks starts reading	Marks wife also starts reading	Mark sees on his bookmark that is wife is reading
TASK LIST	A. Install app on phone B. Connect to bookmark through wifi C. Mark determines his goal and chooses his preferences	A. Mark adds his wife as a contact B. Mark adds the book he is currently reading	A. Mark opens his book B. Mark sees the bookmark lighting up C. Marks wife gets a notification	A. She sees and feels a notification that Mark is reading B. She grabs a book and opens it C. She starts reading	A. Mark notices the heart light B. Mark notices the tree is slowly growing
FEELING ADJECTIVE	Frustrated – because he struggles with connecting Knowledgeless – doesn't know what he needs to do exactly and what the functionalities are Curious – about the possible functions	Annoyed – doesn't know where he can do this/ can't find book in database/ can't find wife's profile	Relaxed Sad – missing his family Excited Hopeful – that his wife will see the notification	Connected Relaxed Delighted – sees that husband is reading Disappointed – because she doesn't have time to read now	Connected Relaxed Comforting - Happy
IMPROVEMENT OPPORTUNITIES	Make connecting procedure intuitive/ Offer guidance Make it available offline	Better user interface	The lights have to be enough so Mark can read with just the bookmark	Personalisation of the notification, so it is not at an inconvenient moment Send reminder that Mark is still reading so she can join him later when she does have time	Notification could not work, which leaves Mark sad and more alone

Persona: Paige

Goal: To start reading a book when she has free time and keep reading even if she has difficulty concentrating. Getting motivation by her preset goals through notifications.

ACTION	Finding motivation for reading	Start reading a book	Keep reading the book (for a longer period of time)
TASK LIST	A. finding time for reading B. finding a calm environment for reading C. getting a notification from her phone about the fact that she has only spent reading a couple of minutes	A. Put/fold to bookmark away B. Keep her phone away C. Start reading	A. Looking at the bookmark and see the progress to keep motivated to continue reading
FEELING ADJECTIVE	- Apprehensive - Anxious - Frustrated	- Excitement - Being challenged	- Distracted - Disappointed - Motivated
IMPROVEMENT OPPORTUNITIES	- The notification should not be condescending - The notification can come from a different source rather than the phone?	- Motivate her to keep her phone away - Make her phone less distracting	- How the progress is being shown can be either motivating or demotivating, so extra care on how this information is displayed can be helpful

Persona: Paige

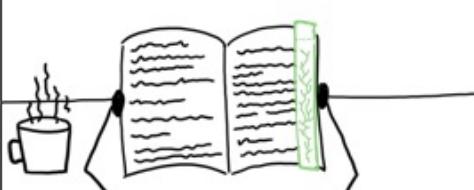
Goal: To connect with a friend through reading and therefore be more motivated to read. To be able to discuss what they've read and developing her internal motivation.

ACTION	Spotting the notification	Start reading a book	(Sending a "heart" to her friend)	Calling a friend and discussing what they've read
TASK LIST	<ul style="list-style-type: none"> A. Receive a notification while she is doing something else on her phone B. Realise that her friend just started reading 	<ul style="list-style-type: none"> A. Put/fold the bookmark away B. Keep her phone away C. Start reading 	<ul style="list-style-type: none"> A. Her friend receives a quick haptic sign and light to her friend that indicates that she is reading as well 	<ul style="list-style-type: none"> A. Calling a friend B. Talk about what they've read C. Optionally looking up info from their reading app about their activities
FEELING ADJECTIVE	<ul style="list-style-type: none"> - Excited - Being compared to her friend / behind 	<ul style="list-style-type: none"> - Excitement about social connection - Being challenged 	<ul style="list-style-type: none"> - Connected - Happy 	<ul style="list-style-type: none"> -Connected - Motivated
IMPROVEMENT OPPORTUNITIES	<ul style="list-style-type: none"> - Do not make reading together a competition (e.g. avoid leaderboard with reading times) - Resend notification that friend is still reading in case she is not near her book at the moment of first notification 	<ul style="list-style-type: none"> - It's difficult to keep her phone away - If she is not near her book, she can't read (maybe snooze the notification) 	<ul style="list-style-type: none"> - It doesn't have to be a button, a different mechanic can be used to do this - Automation would be nice 	<ul style="list-style-type: none"> - They could possibly spoil the other if one reads faster - The one that read less could feel less good about themselves due to the competition aspect

E STORYBOARDS

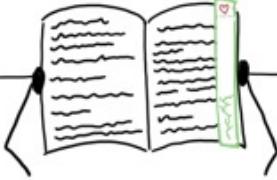
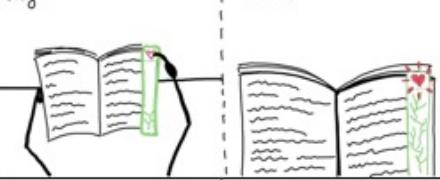
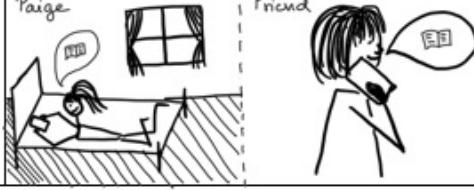
Storyboard

Paige - Scenario 1

1. She is at the cafe and has some free time	
2. She receives a notification that she only spent 5 minutes reading on that day	
3. She starts reading	
4. Her attention begins to drift	
5. She can see on the bookmark that she has almost reached her goal	

6. She continues reading	
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Paige - Scenario 2

1. She is at home watching TikTok on her phone	
2. She receives a notification that her friend is reading	
3. She starts reading so that they can read at the same time	
4. She sends a "heart" to her friend	
5. After reading they call each other and discuss what they've just read	

F SCENARIOS (VIGNETTE STUDY)

F.1 Scenario 1

Please read the following scenario carefully and try to picture yourself in the situation. Afterwards, you will see images of the app and the prototype version of the bookmark to help you imagining using it.

Imagine yourself nestled in the corner of your living room, where a cozy armchair waits for you to sink into its plush cushions. Its a calm sunday afternoon and the sunlight streams through the window, casting a glow over the room and highlighting the shelves filled with your books. With a sip of your favorite herbal tea, you want to try out the new reading tool that you've got your hands on. Recently, you heard that two friends are using a novel bookmark paired with an app. Intrigued by the idea, you decided to purchase this bookmark, curious to see how it could change your reading journey. Today, as you settle into your favorite armchair, you pull out your smartphone, ready to set up the app. You download the app and open it. Your goal is to add the book(s) you currently read, add your friends, and set your personal reading goals.

F.2 Scenario 2

This second scenario builds upon the first scenario you have read. Please read it carefully and try to picture yourself as the user. After the scenario, we will ask you to answer some questions. It is important that you answer the questions in such way, that you imagine yourself in the scenario. Please assume that both the app and the bookmark are fully functional.

You have just finished setting up the app. You put your phone away and take another sip of your tea with your favorite book already on your lap, waiting to be opened. You attach the bookmark to the back of your book and start reading. While you are reading, the leaves of the tree slowly light up one after another. Suddenly, your book vibrates in the pattern of a heartbeat. You notice that the window in the top of the tree lights up - it looks like someone's home! One of your friends has just started reading. You continue reading and slowly you see the top of the tree shining brighter and brighter. Finally, the whole tree is lit up and you have reached your daily reading goal.

G WEB APPLICATION

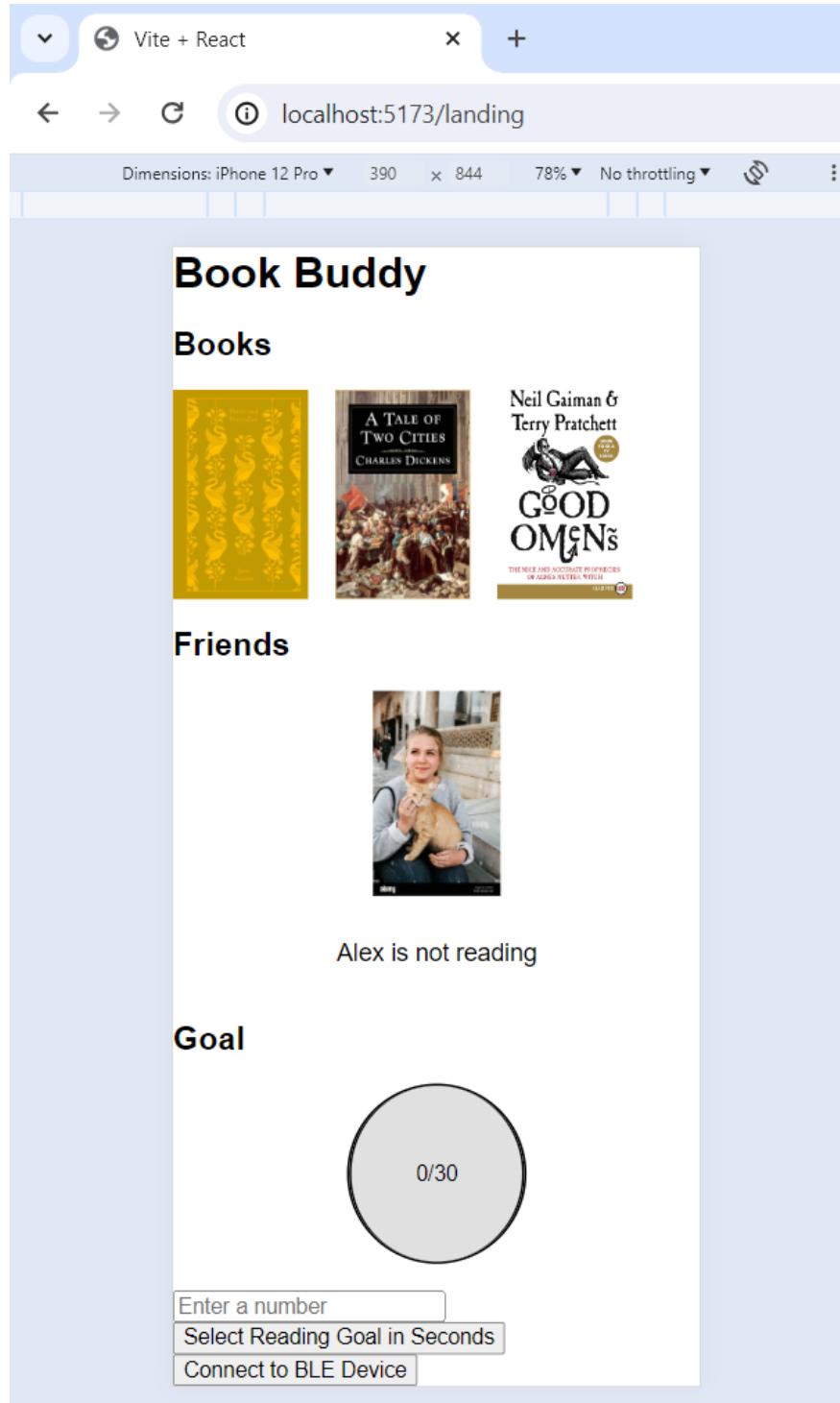


Figure 9: Web application main page