

Hormonal Cycle Tracking Game:
Gamifying Tracker Mobile Applications for Lifelong Learning

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Link to Interactive Prototype:

<https://www.figma.com/proto/FeqHVLykTFGw025YYK6H2G/Periodt.?page-id=0%3A1&type=design&node-id=1-3&viewport=367%2C248%2C0.09&t=gTQMbjog5N403x9G-1&scaling=scale-down&starting-point-node-id=1%3A3&mode=design>

Link to Design Files:

<https://www.figma.com/file/FeqHVLykTFGw025YYK6H2G/Periodt.?type=design&node-id=0%3A1&mode=design&t=ifQ8w5u7Snx9pr65-1>

Introduction

As we move near the closing of the information age, with AI and unlimited data just at the tips of our fingers, it has become clear that learning is not just about citing information. No longer do we need exams that test our textbook retention. Our upcoming generation is now being introduced to the importance of lifelong learning, shining a light on the power of wisdom. Unlike knowledge and facts, wisdom is personal. Wisdom comes from experience and understanding perspectives within and beyond oneself.

One of the most significant stages of life for young students is going through puberty. This transformative time is inevitable, yet daunting to move towards the unknown. Unfortunately, education targeting this period of rapid growth remains underserved, with many schools lacking any curriculum to guide students.

As young girls enter this stage, they are introduced to a major change in their body-menstruation. A change that is full of taboos and negative societal connotations.

“Why is she upset?” “I’m sure she’s just on her period.” Young girls experience a change in their bodies that follows them for the next 50 years. A change that can influence their hormonal influx and well-being.

Many people's first reaction to getting their period is that there is something wrong. “Am I dying” “What is wrong with my body? Young girls are growing up continuously fed the same sentiment. That something is wrong with them, that they’re not pretty enough, skinny enough, not talented enough. In many countries around the world, menstruation has a connotation of dirty, and unclean. People may even be punished for having their period. Without a doubt, living with menstruation is a difficult hurdle that humans all around the world face growing up.

Whether you are a young girl getting her first period, or an adult managing chronic cramping, the estrogenic composition of the female reproductive system can dictate a large aspect of women’s lives. In a beautiful cycle, each month contains hormonal cycles that affect the body's well-being. Each phase of the cycle holds its properties. Regulating and monitoring these hormonal changes can increase the individual's well-being each day.

Problem

- a. Menarche occurs at earlier ages, and many girls now experiencing their first periods before age 12. (Lacroix, 2023)
- b. Knowledge Deficits in Girls
 - i. Studies globally show girls lack preparation for and knowledge about their first period. In a US survey, over 50% of girls reported feeling “totally unprepared” for menarche (Herbert et al., 2017). Knowledge gaps center on using products, anatomy, cycle variability, and self-care. Qualitative data reveals girls often rely on equally misinformed peers or commercials for information (Schooler et al., 2005). These deficits cause fear and anxiety at menarche. Similar trends are well-documented internationally, including in India, Iran, and Tanzania (Garg et al., 2001).

There is limited recent statistical data on exactly what percentage of women know how to track their hormone cycles. However, here is a summary of related statistics that provide some indicators:

- A. In a 2015 survey of over 2000 women in the United Kingdom, only 37% said they could identify when they are ovulating, suggesting limited knowledge of hormone cycle tracking among most women (Epstein 2007).
- B. A 2016 study published in the *Journal of Women's Health* found that among a sample of over 1400 women in the U.S., 43% were not able to correctly identify the length of the menstrual cycle, indicating gaps in hormone cycle knowledge. (Jørgensen, 2016).
- C. In a 2017 U.S. survey by Obsev, 61% of women reported tracking their periods in some form, but methods varied from apps to calendars. The extent of detailed hormone cycle tracking was not specified (Broad, 2022).
- D. According to a 2022 survey by menstrual disc company Intimina, over 50% of women wish they had learned more about reproductive health in school, pointing to continued education gaps (Intimina, 2022). 74% of women couldn't label the female reproductive system.
- E. Download rates for period and fertility tracking apps number in the tens of millions, suggesting a desire among female users to understand hormone cycles, though app literacy differs from general knowledge.

Overall the limited data indicates a significant percentage of women need help to identify details like cycle length, ovulation dates, and fertility windows without using tracking tools. However, the ubiquity of period-tracking apps also indicates an interest in understanding hormone patterns. More comprehensive research would be needed to reliably quantify women's precise knowledge

of hormone cycle tracking across populations. However, existing indicators point to room for improvement in education and awareness.

c. Taboos Around Education

- i. A major contributor to knowledge gaps is the taboo status of menstruation limiting education. Parents, teachers, and doctors describe discomfort in discussing periods stemming from cultural stigma (Gultie et al., 2014). School-based education is often inadequate or omitted entirely. When addressed, lessons emphasize secrecy and shame rather than empowerment. This taboo status delays and distorts menstrual information conveyed to girls in their formative years.
- ii. According to a 2016 report by the Centers for Disease Control and Prevention (CDC, 2016), only about half of U.S. states require schools to teach sex education. Of those, even fewer mandate detailed instructions about puberty.
- iii. Another 2020 CDC analysis found that 93% of high schools, 48% of middle schools, and 17% of elementary schools teach some form of sex education. However, only about 40% of high schools provide instruction on the topics of puberty, menstrual cycle, and reproduction - the lowest coverage rates (CDC, 2020).

d. Lasting Knowledge Gaps

- i. Problematically, research also finds menstrual knowledge often remains poor throughout adulthood. Surveys of adult women reveal misunderstandings about reproductive anatomy, cycle length variability,

fertility, and product safety persist (Rembeck et al., 2006). Stigma contributes to reliance on myths and commercial claims over medical facts. Girls and women both report needing more information on self-care and symptom management (Schooler et al., 2005).

e. Consequences of Poor Education

- i. These widespread knowledge gaps lead to negative health and social consequences. Insufficient education is linked to poor menstrual hygiene practices and adverse reproductive health outcomes (Sumpter & Torondel, 2013). Girls' shame and anxiety are also traced to inadequate menstrual preparation. Across contexts, researchers emphasize quality education is essential for improved well-being and empowerment related to menstrual health.

Recent studies indicate young girls frequently turn to online and social media sources for information about puberty and menstruation. Surveys show between 52-75% of girls report using websites, blogs, video sites, and forums to prepare for puberty, beyond school learning (Ida et al., 2022; Mason et al., 2021). Books also remain a common educational resource, with 55% of girls reporting reading print puberty books (Herbert et al., 2017).

However, research raises concerns about the accuracy of online menstrual content. Content analyses reveal most youth-oriented websites and videos contain misinformation, like overstating cycle irregularities or product claims (Ghattas et al., 2018). Only 25% of online sources demonstrate high quality and reliability (Ida et al., 2022). Puberty books also vary, with fiction-focused stories diluting medical facts (Herbert et al., 2017).

Still, tailored media and books resonate with youth needs more than generic school instruction (Mason et al., 2021). Developing quality resources in engaging formats, instead of limiting internet access, is recommended (Ghattas et al., 2018). Combining digital resources with interpersonal education may be optimal (Herbert et al., 2017).

In the digital age, girls frequently use media and books for menstrual learning, but quality varies greatly. While knowledge gaps remain, intentionally designed resources show promise for supplementing school education with engaging, relatable puberty information. Careful evaluation of sources is still required until consistently high-quality content is achieved.

There are several reasons why providing education on puberty, menstruation, and hormonal cycles would still be important for both young and older women in 2023:

For young women:

- ii. Many still receive inadequate preparation before getting their first period, leading to fear, shame, and unhealthy practices when menstruation begins. Comprehensive education can help girls feel empowered and prepared.
- iii. Gaps in understanding reproductive anatomy and biology persist. Accurate education is essential for informed healthcare and family planning decisions later in life.
- iv. Menstrual cycles impact most aspects of adolescent development. Education enables girls to understand the connections between hormones, emotions, health, and sexuality.
- v. Reducing stigma and taboos is key to emotional well-being. Education can foster confidence.

For older women:

- vi. Midlife hormone changes impact health in perimenopause and menopause. Many women feel unprepared for symptoms and cycle shifts. Education can help women care for themselves during this transition.
- vii. Embarrassment discussing feminine health remains common in adulthood. Education can empower women to have informed conversations with doctors.
- viii. Later pregnancies are increasingly common. Understanding fertility and cycle shifts with age allows women to make intentional family planning choices.
- ix. Reflecting on earlier experiences provides perspective and an opportunity to build self-esteem for the future.

Overall, education remains essential in 2023 to fill knowledge gaps, dismantle stigma, empower healthcare literacy, and understand the lifelong impacts of hormonal cycles. Both young and mature women have much to gain from meaningful instruction grounded in science and social progress.

Filling Knowledge Gaps

The four phases of the menstrual cycle are the follicular phase, ovulatory phase, luteal phase, and menstrual phase. Estrogen levels begin low during menstruation then steadily rise during the follicular phase, peaking right before ovulation. Progesterone remains low during the follicular phase. During ovulation, estrogen drops slightly and progesterone begins to rise. Both estrogen and progesterone peak during the luteal phase. If no pregnancy occurs, hormone levels drop rapidly, triggering menstruation and beginning the cycle again (Reed & Carr, 2018).

Hormonal fluctuations during the menstrual cycle can significantly impact energy levels, mood, and physical comfort throughout the month. For example, the dip in estrogen during menstruation can cause fatigue, irritability, and cramps. The sharp drop in both estrogen and progesterone pre-menstruation has also been associated with symptoms like depression, migraines, and joint pain (Romans et al., 2012).

Research demonstrates lifestyle habits can help counteract menstrual symptoms tied to hormonal changes. In the follicular phase, aerobic exercise may help reduce fluid retention and breast tenderness as estrogen rises (Kishali et al., 2006). Foods rich in complex carbs, iron and vitamin B6 like spinach, lentils, and salmon can relieve low energy (Kessel, 2001). Getting adequate sleep is also important as cycles of REM sleep shift across the menstrual cycle (Baker & Driver, 2007).

Around ovulation, yoga and meditation may help manage mood shifts and stress (Kanojia et al., 2013). Anti-inflammatory foods like strawberries, walnuts, and fatty fish can ease discomfort. As progesterone peaks in the luteal phase, low-intensity exercise like walking avoids aggravating fatigue (Oosthuyse & Bosch, 2010). Calcium-rich foods like sesame seeds and figs support progesterone production (Kessel, 2001).

Premenstrually, ginger, cinnamon, and sage tea can reduce menstrual cramps (Jenabi, 2013). Light exercise boosts endorphin levels while avoiding overexertion. Talk therapy and expressing emotions may alleviate PMS mood effects (Ussher, 2003). Self-care practices like massage, warm baths, and napping ease this transition phase.

Overall, tailoring nutrition, physical activity, stress relief, and rest to individual cycles and preferences can optimize well-being across the menstrual phases. Tracking symptoms and lifestyle factors provide data to customize effective self-care regimens.

UX research

To gain insights beyond quantitative data, a focus group with two randomly selected menstruators was conducted to hear more quantitative data about their menstrual experience.

Below is the list of questions discussed during the focus group.

- f. How comfortable do you feel talking about your period?
- g. What was it like experiencing your first period?
- h. Were you satisfied with your menstrual education? What did you learn growing up?
- i. What are the difficulties you face surrounding your menstrual experience? How do you currently mitigate those difficulties?
- j. Do you participate in period tracking? What tools do you use?
- k. What changes have you made in your daily life to improve your menstrual experience?

Focus Group Results

Here is a summary of the key points from the period tracking conversations:

- The speakers feel comfortable discussing their periods openly now to normalize menstruation, but it wasn't always this way growing up due to stigma.
- Their first-period experiences were met with some fear and anxiety due to inadequate preparation. Peers were often sources of information vs parents/teachers.
- Most education around puberty focused on sex and pregnancy prevention rather than practical details about menstruation.
- Irregular cycles, especially from birth control, are frustrating and worrisome since they differ from "normal" patterns.

- Serious reproductive health issues like ovarian cysts and bleeding caused distress but doctors provided little information on causes or prevention.
- The speakers track periods using various apps but have issues with inaccuracies, costs of premium features, and privacy controls.
- Periods impact their lifestyle choices - they adjust workouts, eat more, take baths, and drink alcohol to cope with bad cramps and PMS.
- Difficulties like severe PMS mood swings, pain interfering with work/school, and longer periods due to birth control affect quality of life.
- Negative period experiences include stigma around first menstruation, dismissal of pain by doctors, unexpected spotting, and terrible cramps.
- More transparency around how periods change over time and validation of irregularity could ease anxiety around menstrual cycles.

In summary, the conversations illustrated both how far menstrual stigma has come through openness and current educational gaps, healthcare barriers, and cycle unpredictability that still cause major hurdles for women and girls during puberty and beyond. These conversations have helped inform some main design points that should be focused on in the designed solution.

- Irregular cycles and changing periods, especially due to birth control, are a major source of anxiety. The app should provide education and realistic expectations for how hormones impact cycles. Knowing irregularity is normal could reduce stress.

- There is a lack of understanding around issues like ovarian cysts. Tracking unusual pains and logging symptoms could help identify health problems earlier. Educational content about reproductive issues would also be beneficial.

- Privacy around tracking is important, especially for younger users. Providing password protection and letting users hide log details could help with discretion.

- Knowing when ovulation/fertile days occur is desirable for contraception purposes. Features to predict this without paying would empower reproductive agencies.

- Users want to understand connections between lifestyle factors like diet, alcohol, and exercise on cycle symptoms. Customizable tracking dimensions beyond just dates would reveal personalized insights.

- The ability to add notes and contextual details to cycle data is valued by users for looking back on experiences. Flexible tracking promotes reflection.

- Data visualizations and digestible summaries of patterns over time could enhance learning around individual cycles. Users want to know their normal.

In summary, key opportunities exist to leverage tracking to promote menstrual literacy, self-knowledge, proactive healthcare, and destigmatization. Design should focus on female empowerment through cycles of education.

Solution

Developing an educational period-tracking app focusing on hormone cycle tracking and empowering education could improve public knowledge, reduce stigma, and promote healthy behaviors around menstruation.

1. Review of current period apps

- i. Clue: This popular menstrual cycle tracker includes an optional "clue bits" reward system where users earn points for logging health data that can be redeemed in the app store.

- ii. Flo: Flo offers quests, badges, and points for tracking cycles, symptoms, and self-care habits. Users level up for consistency and can join teams for competitions.
- iii. FitrWoman: This app gamifies exercise recommendations tailored to different menstrual cycle phases. Users earn points for workouts that unlock educational content.
- iv. Groove: Groove turns to building healthy period and fertility habits into a game with daily goals, points, and rewards.
- v. Oova: Oova incentivizes tracking with virtual coins and badges for consistency. Users can customize their monster avatar.
- vi. Maya: Maya's calendar system awards jewels and trophies for tracking periods, sex, symptoms, and mood. Unlocking achievements educates users on cycle health.
- vii. Dadi: Dadi offers a light gamification system with points earned for learning about fertility and consistent tracking.

Most hormone and period-tracking apps that use gamification rely more on points, badges, and challenges rather than extensive storylines and characters. However, there are a few exceptions:

- Groove has users care for a virtual "Furbie" creature that reflects cycle status and needs attention. This creates some narrative engagement.
- Maya features a goddess character named May who provides education and encouragement as users progress. She adds some personality and storyline.
- Oova's monster avatar for users to customize, name, and track has light character design elements.

- Cluebits within Clue can be used to unlock "mystery gifts" that reveal story tidbits about the app's mascot Clara. This builds a limited narrative.
- Flo has users join teams of fictional characters for competitions, providing minimal character-driven plots

But overall, most gamified hormone and cycle trackers focus mainly on points, levels, challenges, and rewards rather than rich storytelling and characters. The apps are targeted primarily at adult users, so extensive narrative generally takes a backseat to limited game mechanics aimed at driving tracking engagement. Very story-driven, character-based gamification is rare in this category of app. The storylines tend to be minimal and not the core focus.

- Apps like Clue and Flo allow logging symptoms like acne, cramps, breast tenderness, mood changes, etc. that provide insights into hormone fluctuations.
- Some apps let users log basal body temperature, which can identify ovulation based on temperature spikes and dips related to hormones.
- Tracking cervical mucus quality and quantity in apps can help pinpoint fertile windows as estrogen rises and falls.
- Apps focused on fertility such as Ovia allow detailed charting of positive/negative ovulation test results reflecting LH surges.
- Besides ovulation, some apps prompt users to log PMS and PMDD symptoms associated with hormone changes.
- Users can track menstrual flow and consistency which indirectly correlates to hormone levels.

- Some apps even allow users to log lab results of hormone levels like estrogen, progesterone, and testosterone if known.
- Apps can use cycle data like period start dates to predict hormone patterns and future fertility windows.

So in summary, while few apps focus exclusively on hormones, many provide ways for users to observe and record hormone-related changes, enabling them to better understand the detailed workings of their cycles. However, the accuracy and depth of hormone tracking vary greatly across apps.

Learning Goals

Healthy menstruation can be defined as having regular, manageable cycles without significant distress or disruption to daily life. Key healthy behaviors include:

- Self-care practices like rest, modifying activities, and comfort measures during menses to alleviate physical and emotional symptoms (Johnston-Robledo et al., 2003)
- Attentiveness to proper hygiene through access to clean menstrual products and private sanitation facilities (Sumpter & Torondel, 2013)
- Cultivating self-awareness and confidence through menstruation tracking and education (Rembeck & Gunnarsson, 2004)
- Communicating needs surrounding cycles to intimate partners, family, schools/workplaces to request accommodations as desired (Chrisler, 2008), and feeling comfortable doing so
- Obtaining medical care as needed for issues like painful periods, irregular cycles, or premenstrual disorders (Shah et al., 2021)

- Making informed reproductive health choices regarding contraception, protection, pregnancies, etc. based on cycle knowledge (Gomez et al., 2019)

A healthy relationship with one's period involves accepting it as a normal bodily process and connecting with its role in fertility. Having access to the above resources to manage cycles according to individual needs promotes a sense of competence and empowerment around menstruation (Chrisler, 2008). Positive associations counteract secrecy and shame. However, comfort discussing periods varies based on cultural messages received. Developing a healthy relationship is an ongoing journey shaped by knowledge, self-efficacy, and support systems.

To categorize information to be delivered in a daily manner, the main learning goals above were identified to be:

1. Self-care practices

Engaging in rest, modifying activities, and healthy diets during menstruation to alleviate physical and emotional symptoms.

2. Hygiene and Products

Maintaining proper hygiene through well-rounded knowledge of menstrual and birth control products.

3. Cycle awareness

Cultivating self-awareness and confidence through menstrual cycle tracking, education, and understanding usual patterns.

4. Communication and Healthcare

Communicating needs surrounding menstrual cycles to others and obtaining medical care as needed for issues like painful periods or irregular cycles.

Delivery method

Making a gamified hormone-tracking app universally accessible has several benefits. Mobile apps are convenient, portable platforms that can reach people across demographics. Integrating gaming elements into an app tracker makes it more engaging and rewarding to use consistently, which improves adherence in tracking cycles. Widespread access normalizes period health and encourages open discussions. Population-level data from app users can reveal insights on trends and inform public health initiatives related to menstrual health. An inclusive, game-based tracking app promotes cycle literacy and empowerment for all who menstruate, enabling them to understand their bodies, communicate their needs, and make informed choices. Apps are private ways to obtain individualized data, suiting the personal nature of menstrual health. The discretion of apps helps decrease the stigma and taboos surrounding periods. Overall, a fun, educational tracking app accessible to everyone can have individual benefits of promoting self-care practices and cycle awareness, as well as population benefits of improving health equity and understanding of menstrual patterns.

Game-based learning

Gamification can increase the appeal, enjoyment, and short-term adherence of habit-tracking apps. Gaming elements may be especially promising for reinforcing exercise and fitness habits. Ensuring apps have personalized options and promote intrinsic motivation will be critical considerations moving forward.

Research shows gamification elements can increase user enjoyment, which may improve app adherence. Surveys of habitual behavior app users find that those using gamified versions rate them as more fun and satisfying than non-gamified trackers (Koivisto & Hamari, 2019). Experimental designs also demonstrate high engagement and satisfaction with gamified trackers compared to standard self-monitoring (Sardi et al., 2017). The inclusion of avatars, challenges,

rewards, and progression tools may heighten motivation and perceived achievement. However, personalized game preferences should be considered.

While advantages for fitness are well documented, less research examines gamification for other habits like sleep, nutrition, and mindfulness. Initial studies indicate the potential for gaming principles to encourage habit formation outside exercise. In one small trial, the gamified app Habitica was more effective than a standard tracker for adherence to new household routines (Tan & Chen, 2019). Users also formed more habits and enjoyed the competitive, rewarding features. However, large-scale studies across diverse habits are still needed to confirm the effects.

Narratives and Storylines

Current evidence suggests storytelling and character integration can meaningfully enhance gamification engagement, enjoyment, learning, and behavior change efficacy. Yet implementation considerations temper unbridled optimism. More research is still needed to develop instructional design models for fusing narratives strategically with basic gamification systems. With careful construction, stories show promise for sustaining motivation that point systems alone often lack.

Evidence suggests that story-based games intrinsically motivate players more than point and reward systems alone. Surveys reveal that narrative-centered games rated higher in enjoyment than those focused on achievements (Ryan et al., 2006). Stories allow for creative freedom and interpreting meanings, versus rule-based play. They also evoke emotion. Neuroimaging studies show that story-based games stimulate language processing and empathy circuits more than non-narrative games (Bouchard et al., 2013). Thus, stories may heighten gamification's immersive and rewarding effects.

Attachment and relation to characters also improve motivation, per media research. A meta-analysis found that perceived similarity, empathy, and parasocial bonds with characters predicted higher game enjoyment (Tukachinsky, 2020). Customizable avatars allow players to enhance identification. Developing characters central to the gamified activity provides figures for users to relate to and invest in. This engagement transcends external incentives like points.

Several studies reveal storytelling and character design strengthen gamification specifically for health behavior change games. A diabetes management game with personalized storylines led to greater knowledge gains than a non-narrative version (DeShazo et al., 2010). A fitness app with an immersive heroic quest narrative also produced higher exercise motivation than basic tracking (Zuckerman & Gal-Oz, 2014). Characters embedded in the gameplay created deeper emotional investment. Such research indicates narrative game elements may boost learning and self-efficacy.

Constructivism

According to constructivist learning theory, individuals actively build knowledge by integrating new information into existing mental models based on their unique experiences (Ultanir, 2012). Rather than passively receiving fixed facts, learners construct personalized meaning.

This suggests that a gamified app could provide an interactive platform for girls to actively reconstruct limiting attitudes around periods shaped by stigma and shame. The narrative storyline and characters would situate factual information on puberty within an engaging coming-of-age journey. Gamification elements like quests and rewards would motivate active participation, driving knowledge construction (Dichev & Dicheva, 2017).

Instead of treating periods as an affliction, the app would frame it as a normal step in development through relatable characters that model self-care and pride. Tracking features would allow girls to observe their cycles, constructing personal meaning. By interfacing with the app as empowered protagonists, girls could integrate new menstrual knowledge to transform fear into perceived competence.

Thus, constructivist-aligned design would facilitate the co-creation of menstrual understandings, tailored to each girl's context. This process of integrating puberty facts within an uplifting narrative could nurture more affirmative embodied experiences, countering stigma. Applied thoughtfully, a gamified app could therefore enable girls to construct improved menstrual well-being and embodiment.

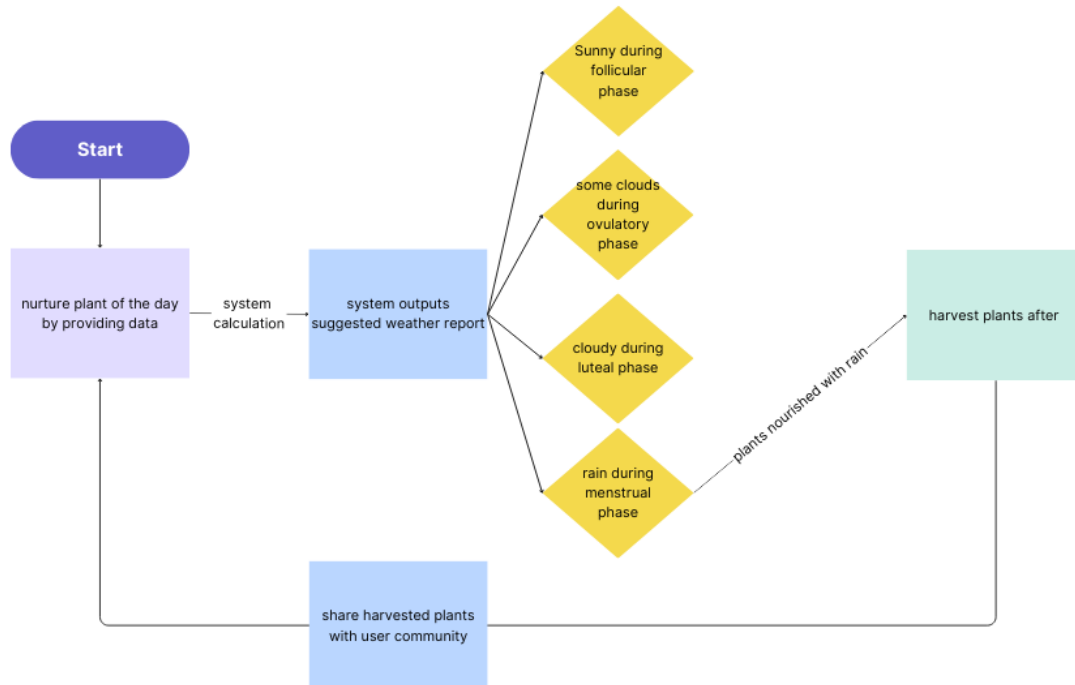
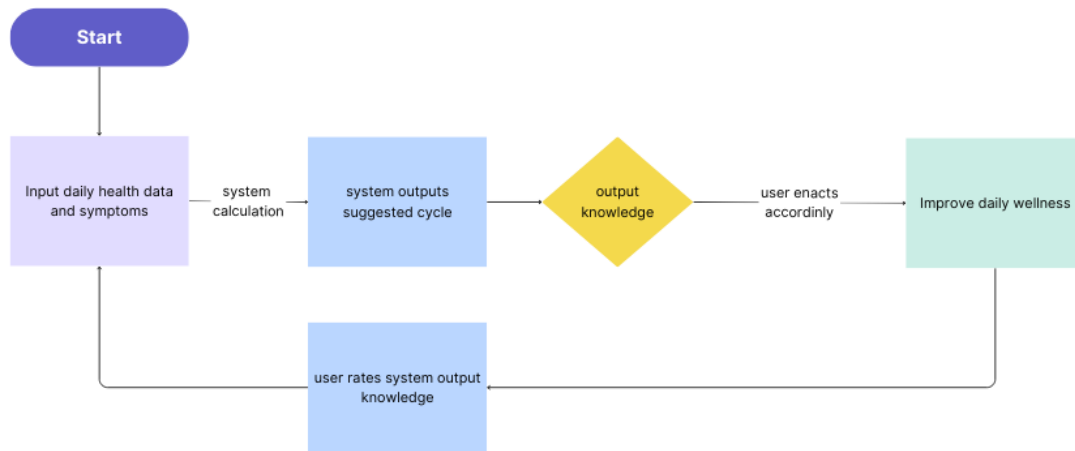
Game Foundation

The central concept of the game surrounds daily gardening. As users tend to their gardens and plants, scaffolding in the game encourages users to take care of their bodies as well. The four learning categories are represented based on plant type, embedding different aspects of menstrual health into the game design.

Self-care practices = Tulips Hygiene and products = Carrots

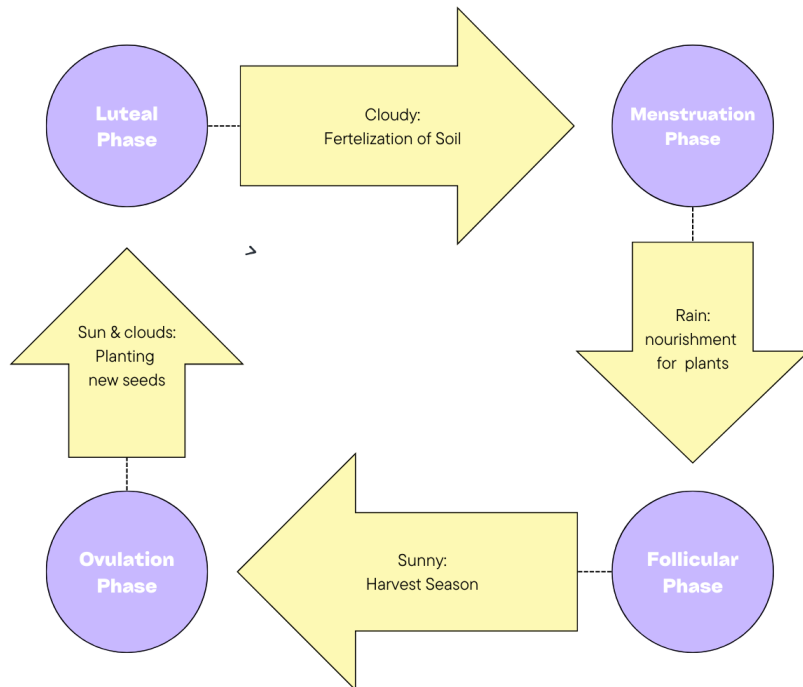
Cycle awareness = Strawberries Health care communication = Cotton

The goal of the game is to nurture your garden so that users generate resources that enable their access to the game.

Core Loop

Weather cycle

Based on each stage of the user's menstrual cycle, the weather of the garden changes in accordance.



This provides to what the user has already planted, as a monthly harvest occurs after every rainy season. Harvested plants can be used as resources for further interactions.

The app also provides users with weather predictions, essentially helping the users map out when each cycle of the phase they will be in, and plan their monthly schedule accordingly.

Daily Inputs

To track the user's cycle data and well-being, the user selects a plot of soil indicated for the date. This will open a screen for the user to input data for period flow, spotting, mood, pain, sleep, and any additional symptoms. Once the data is saved, the user selects one out of the four plants for the plot of land based on the returned information that was most helpful. This assists the system in learning the user's needs for learning and informs future information delivery. Each

day, users repeat this ritual for the next plot of soil, filling their garden as the month progresses. The goal is to encourage the user to form a daily habit of checking in on their well-being and staying connected to their body.

Adaptive Knowledge Delivery

Based on learning goals, knowledge regarding menstrual health can be divided into 4 categories: Self-care practices, hygiene and products, cycle awareness, and healthcare communication. Based on user input of their symptoms of each day, the system will deliver information best suited for the user's needs. For example, if a user inputs period flow as heavy, the system will suggest intake of enriching foods like chocolate or salmon to increase omega-3 intake, as well as supply information on different menstrual products for users to be aware of.

Mentorship Model

To serve both interest groups of young girls experiencing puberty, as well as adult women managing their menstrual health, the system allows users to opt into a mentorship mode. Users are assigned a mentor, defaulting each other's character and garden to be accessible to each other. To interact with their mentor. The resources described before can be combined to create different items, and items can be gifted to the mentor or mentee for additional friendship points. To chat with their mentor or mentee, the user must include with their conversation a gift of resource. This can help visualize the bond between the users and create motivation. In the context of the game, the characters can use the plants they have harvested to create meals, drinks, and bouquets to gift each other.

Community Features

In addition to each user's home garden, users can travel in the game to four default planets, again corresponding to the four learning categories. Upon entrance, each planet provides

a community forum of knowledge points that may be useful for all users. At these planets, all users can vote on each knowledge point with the corresponding resources they possess. Based on votes, the system arranges tips that have been voted most helpful on the top of the page, then lists the rest in descending order. This allows an additional space for verification and highlighting key knowledge points that have been proven to be helpful to users. On top of voting, if the users have enough resources, they may also add their suggestion tips to the community forum, allowing other users to vote for their custom postings. Overall, this feature provides an intentional space to interact with a community with shared struggles, as well as allowing users to input additional information they find necessary that the default system does not include.

Customization

The decision to include a cotton plant allows space for users to craft clothing items for their designated character. Users can decide how to dress their character to provide a sense of individuality in the game.

In addition to the default four planets, users may add their close friends with their unique username, which adds their friend's planet to their map. This allows the two users to interact similarly to the mentorship model, in which users can interact with each other's characters and send each other knowledge points that they find meaningful. As planets are added, each user's map expands differently across all users, allowing a custom community based on their real-life relationships.

Design Issues

In addition to the current design, the remain spaces for improvement and further development. One key issue is that if users are using the app for the first time, they may not have the necessary resources to access mentorship and voting features in the game. A potential

solution calls for a default number of resources for users to start the game with, and users will organically harvest resources after their first cycle has been completed, after each rain season.

Another potential issue lies in the community feature, where users can add posts with tips and discussions about certain menstrual topics. However, this opens the forums up to the vulnerability of false or harmful information if the information is not properly verified. The first solution could be to require each post to go through a verification process for the admin to approve before they are visible to all users. This allows the admin to interfere before something harmful is posted, but the solution lies in the power of the admin with a centralized verification process. A second solution could be to allow users to downvote or report false information. This gives the community more power to decide for themselves what information to implement but allows a chance for harmful information to be seen before it is reviewed. Overall, the goal is to foster community, so the second approach may be more democratically favored, with a similar model to most social media moderation.

Finally, it is likely for users to be concerned about the privacy of their data, especially when it surrounds a sensitive aspect of their lives. A secure data environment must be ensured for this application to be possible, to ensure the safety and security of personal information. The game should not require any personal information that can be traced back to their legal data, like full names, emails, birthdays, and such. This highlights the importance of customization features, as users will only be identifiable by their custom username and custom character accessories.

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