Offline Oracle: A Gamified Framework for Diagnosing and Fulfilling "True Needs"

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I. Research Motivation & Core Problem

The project targets the common problem of **excessive use of the phone before bed among college students**, resulting in lack of sleep and issues related to executive functioning. The problem causes short-term consequences like lack of concentration and irritability, as well as long-term consequences like reduced self-regulation abilities and anxiety.

However, the thesis of this research is that the issue of overuse of the phone is only the tip of the iceberg. The true, underlying problem here is the inability to satisfy the fundamental **"True Needs"**, such as the need for socialization, the need for self-esteem, and the need for relaxation—a process that has resulted in the search for the quick fix offered by the **"False Substitute"** of digital media.

Thus, the end objective of this research work would not be the creation of just a reward-motivated, playful, and socially enabled campus tradition, but rather the development of a design framework that has the ability to accurately diagnose the True Needs in this manner. This project represents the first empirical iteration of this approach—a crossing of the fields of behavior science, gamification, and HCI to create a product that can be built, measured, and published.

II. System Overview

The **Offline Oracle (Sleep Fortune Box)** is a **hybrid physical-digital system** comprising four key components:

Offline Oracle = Physical Device + Fortune Slips + Companion App + Social & Growth Mechanisms.

1. Physical Device (The Offline Oracle Box)

- **Function:** Uses weight and light sensors to detect when a phone is placed inside for the night.

- **Action:** Dispenses a physical **fortune slip card** as an immediate, tangible reward—testing *immediate/tangible reward interventions (RQ2)*.

2. Fortune Slip

- **Content:** Each slip includes:

  i. A motivational or reflective message.

  ii. A small challenge prompt (e.g., journaling, mindful breathing).

  iii. A unique redemption code to unlock content in the companion app.

- These slips serve both **psychological** and **practical** functions, linking real-world actions with digital reinforcement.

3. Companion App

- **Core Loop:** Students redeem slip codes to unlock **animated digital collectibles**.

- **Extended Gameplay:** Some slips contain **Challenge Codes**, which trigger "dare-like" tasks tailored to student preferences.

- **Features:** A collectibles library, challenge tracking, social pairing, and a **guild points system**, providing data for *RQ2–RQ3*.

- The app also serves as a **data collection instrument**, recording adherence, reward preferences, and interaction patterns.

4. Challenge & Social Layer

This is the **primary intervention and diagnostic module** (for *RQ1, RQ5*).

- **Onboarding Preferences:**

  Upon registration, users select a challenge type:

  (i) *Social-oriented* – meeting new people and light interactions.

  (ii) *Activity-oriented* – sports and group tasks.

  (iii) *Self-growth-oriented* – mindfulness and reflection.

- **Task Difficulty Levels:**

  i. Light – simple tasks (e.g., "Chat with a roommate for 5 minutes").

  ii. Moderate – requires effort (e.g., "Invite a classmate for breakfast").

  iii. High – challenging (e.g., "Organize a 3+ person study session").

- **XP (Experience Points) & Growth Labels:**

  Completing challenges earns XP and increases the student's public **Challenge Label**:

  Beginner Explorer → Active Challenger → Campus Pathfinder.

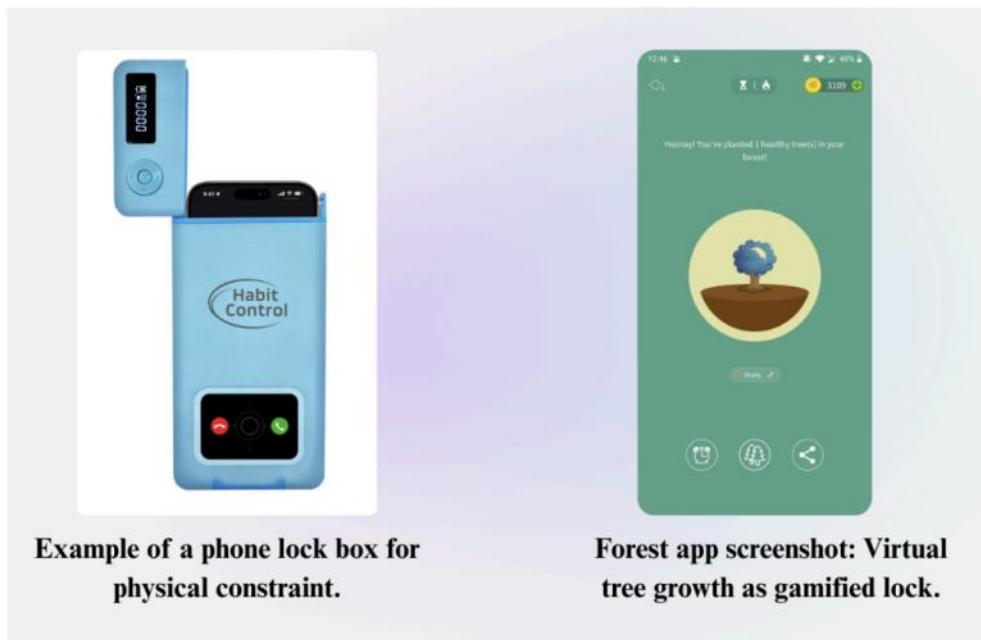 Higher levels unlock more advanced and rewarding challenges.

- **Feedback & Rewards:**

  Successful challenges unlock visual effects for collectibles and contribute to the student's **guild XP**.

  Students can share achievements on the **Campus Wall** for peer recognition.

1. ' Solution with Hardware' (Deployable)

2. 'Real-World Connector'

3. App Interaction -User Data set(Measurable)

Traditional Industry solution for forced self-motivated

Example of a phone lock box for physical constraint.

Forest app screenshot: Virtual tree growth as gamified lock.

III. Core Research Questions

The Offline Oracle serves as an experimental platform to answer the following:

1. **Diagnosis (RQ1):** How can a hybrid physical-digital system identify and quantify unmet "True Needs" behind "False Substitute" behaviors?

2. **Intervention (RQ2):** Which reward combinations (immediate/tangible vs. digital/growth vs. social/collective) best shift user behavior toward True Need fulfillment?

3. **Modeling (RQ3):** How do user behaviors and self-reported need fulfillment evolve during long-term deployment, and can this evolution be computationally modeled?

4. **Generalization (RQ4):** What design principles can be extracted to form an **Intelligent Design Framework for Positive Behavioral Intervention**?

5. **Adaptation (RQ5):** When a user's need is ambiguous, how can the system dynamically adapt strategies using persona data to maximize satisfaction?

6. **Foundational Model (RQ6):** How can long-term behavioral data yield universal, multi-dimensional user features for cross-scenario modeling?

IV. Multi-Layered Reward System

The tool fosters engagement through a cascading reward structure based upon four levels of motivation:

1. **Immediate Reward:** The physical fortune slip received upon phone storage.

2. **Digital Reward:** An animated collectible unlocked through the app code.

3. **Growth Reward:** XP accumulation and Challenge Label progression.

4. **Collective Reward:** Guild-level achievements granting physical-campus rewards (coffee coupons, gym time, print credits, event entry).

Each layer aligns with different psychological drivers—**tangible, symbolic, and social**—creating a sustained loop of motivation and reinforcement.

V. Campus Social & Guild Layer

This layer transforms individual behavior into **community-level engagement**:

- **Campus Pairing:** Slip codes can randomly connect students at the same university.

- **Buddy System:** Matches students with shared goals or routines for mutual accountability.

- **Campus Wall:** A public or anonymous feed for sharing reflections or achievements.

- **Guilds:** Dorms, clubs, or study groups act as teams; guild streaks and XP milestones unlock group-level rewards.

  This enables *controlled study of collective reinforcement (RQ2)* and long-term social bonding effects.

VI. Research Methodology

This project follows the **three pillars** of rigorous design research: *Deployable, Measurable, and Publishable.*

1. Deployable

- Built with a **student-friendly budget** using Arduino, light/weight sensors, and a servo motor.

- Designed for **rapid prototyping** and real-world deployment across dormitories.

2. Measurable

- The system acts as the **primary data collection instrument** ("Offline Oracle Methodology").

- Data types include:

  - **Quantitative:** sensor logs, XP progression, app activity.

  - **Qualitative:** surveys/interviews on need satisfaction, motivation, and perceived community connection.

- Uses **A/B testing** (different reward types) and **longitudinal tracking** (4–6 weeks to semester-long studies).

3. Publishable

- Findings target top-tier venues such as **CHI, CSCW, and UbiComp/IMWUT**.

- Provides an **empirical case study bridging theory and application**, contributing to computational behavioral science.

VII. Non-Profit Membership & Ethical Model

The Offline Oracle follows a **non-profit, donation-based model** ensuring full accessibility:

- All essential features are permanently free.

- Optional cosmetic memberships (Discord Nitro–style animations, Reddit Premium–style supporter badges) exist purely for personalization, **not functional advantage**.

- Clear communication emphasizes that participation is **non-commercial, voluntary, and educational**—aligning with institutional ethics standards.

VIII. Feasibility & Risk Mitigation

Potential Risk	Mitigation Strategy
Rewards may feel insufficient	Tiered slip design mixing psychological, practical, and social value.
Social pairing fails with small user base	Codes double as guild XP boosters or unlock special Campus Wall effects.
Guild rewards feel vague	Partner with student organizations for tangible incentives (coffee, gym, events).
Device feasibility concern	Emphasize low-cost Arduino implementation and open-source reproducibility.
Motivation decay over time	Introduce seasonal events, adaptive challenge loops, and rotating reward themes.

IX. User Flow Example

1. **Onboarding:** Enabling students to select the type of challenge desired, whether it

2. **Night Ritual:** At bedtime, they place their phone into the Oracle Box.

3. **Interim Reward:** The device issues a fortune slip along with a motivational message & code.

4. **Digital Reward:** Code will unlock an animated collectible inside the app.

5. **Challenge Activation:** Optional challenge task tailored to their preference and difficulty.

6. **Completion:** Student completes an objective, gains XP, enhances personal Challenge Level, adds to guild XP.

7. **Guild Milestone:** Dorm or club reaches XP goal → unlocks campus-wide perks.

8. **Long-Term Effect:** The students develop positive sleep routines, overcome digital addiction, as well as make connections.

X. Research Feasibility & Experimental Framework

Longitudinal Field Study Plan

- **Phase 1:** Pilot deployment (N ≈ 20 to 30 students) for tech validation.

- **Phase 2:** 6-week dormitory deployment for behavioral data collection.

- **Phase 3:** 1-semester study for modeling long-term motivation dynamics.

- **Data Analysis:**

    - Behavioral metrics (frequency of phone put-away, sleep onset consistency).

    - Motivation indices (self-report via surveys).

    - Statistical and machine learning modeling for RQ3–RQ6.

XI. Expected Contributions & Broader Impact

Academic Contributions

1. A validated **behavioral diagnosis and intervention model** for identifying and fulfilling True Needs.

2. Empirical evidence on **multi-layered reward mechanisms** in sustaining healthy digital behavior.

3. A **foundational anonymized dataset** for computational behavioral modeling (RQ6).

4. The **first reproducible case study** for an **Intelligent Design Framework for Human-Centered Systems**.

Societal Impact

- Provides a **non-coercive intervention** that helps students form positive nighttime rituals, improve sleep, and strengthen campus community ties.

- Demonstrates how gamification, behavioral psychology, and social design can jointly **redefine digital well-being**.

XII. Final Positioning

Offline Oracle = Sleep Wellness Intervention + Gamified Bedtime Ritual + Campus Social Bonding + Progressive Challenge System.

This negative act of "not using your phone" becomes a positive act in terms of the **following opportunity**:

- **Immediate Reward:** tangible surprise & satisfaction.

- **Personal Development:** noticeable advancement, establishment of personal identity.

- **Collective Motivation:** shared guild achievements and community benefits.

- **Social Support:** connection, collaboration, and celebration.

Outcome: The students will sleep better, feel more connected, develop positive digital habits, thus acting as a lab for research in science as well as an example for interventions in well-being.