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Mandala Meditation Journey: Integrating Cultural Rituals into Digital Meditation Practices

Jiawen Zhang [1] and Nandhini Giri [2*]

[1, 2] *Purdue University*

*girin@purdue.edu

Abstract

This paper narrates the design and development of a Mandala Meditation Journey - a digital meditation application merging Tibetan sand mandala traditions with Loving-Kindness Meditation. We document how abstract compassion practice becomes tangible through culturally grounded design: users create mandalas across four concentric rings representing self, loved ones, difficult persons, and all beings, before releasing their creation into a symbolic river. Our design evolution, informed by six Buddhist practitioners, yielded five design guidelines addressing ritual structure, progressive compassion cultivation, symbolic systems, attention anchoring, and cultural context. User evaluation (N=34) demonstrated significant improvements in self-compassion, with particularly strong reductions in negative self-perceptions: self-judgment, over-identification, and isolation. Usability was rated good (SUS=73.9). Through thematic insights and interface progressions, we offer guidelines for adapting traditional contemplative practices into interactive digital experiences.

Keywords: Meditation Technology; Loving-Kindness Meditation; Mandala; Cultural Integration; Self-Compassion; Contemplative Technology; Digital Wellbeing

Introduction

The Engagement Problem

Digital meditation apps promise accessible wellbeing, yet users consistently struggle to maintain practice (Linardon et al., 2024; Huberty et al., 2019). Despite polished interfaces and guided audio, dropout rates remain high (Linardon, 2023; Schwartz, Ganster and Tran, 2023). The core challenge is experiential: practices like Loving-Kindness Meditation (LKM) ask users to generate compassion toward abstract targets, "send kindness to all beings", without concrete anchors for attention or emotion (Yordanova, 2020; Graser and Stangier, 2018). Users find themselves distracted, disconnected, and ultimately disengaged. Research on self-compassion suggests that abstract emotional exercises bene-fit from concrete, actionable frameworks that make internal processes visible and tangible (Neff, 2023). Traditional practices are historically embedded in cultural contexts that provide meaning and structure (Lindahl, 2023). Recent research has begun exploring how digital technology can preserve and transmit these contemplative traditions while adapting them for contemporary users (Li, Cochrane, and Leshed, 2024). Embodied cognition research shows physical and cultural practices impact meditation outcomes, offering concrete elements that make abstract concepts accessible (Macrine and Fugate, 2024). What if digital meditation could be learned from tradition? A systematic re-view of mindfulness research traces its conceptual roots to Buddhist traditions and their later secularization in Western contexts, while revealing limited engagement with cultural grounding in the design of mindfulness technologies (Terzimehić et al., 2019; Liu et al., 2025).

Our Approach: Integrating Mandala, Loving-Kindness Meditation, and Digital Technology

Our design goal is to identify culturally guided interactions from traditional contemplative rituals and transform them into human-centered digital interactions, thereby supporting a deeper meditation experience and sustained user engagement. The ritual structure of the mandala makes the abstract concept of compassion visible, LKM's phrases anchor emotional intentions, and digital interaction provides accessible and tangible feedback. Together, this approach addresses the problem of user attrition in digital meditation technology.

Mandala

In Tibetan Buddhist tradition, mandalas are sacred geometric patterns created as meditation and offering (Tucci, 2001). Monks spend days placing colored sand grain by grain, building intricate designs from the center outward. Upon completion, the mandala is ceremonially dissolved, sand swept away and released into flowing water, embodying impermanence and releasing blessings into the world (Tucci, 2001;). The practice

encompasses a complete ritual cycle: creation, dedication, and dissolution (Tucci, 2001). How Mandalas foster compassion:

- Center-outward creation mirrors expanding care (Tucci, 2001)
- Slow, deliberate action with structured drawing cultivates patience (Beerse, Van Lith and Stanwood, 2020; Curry and Kasser, 2005; Jakobsson Støre. and Jakobsson, 2022)
- Symbolic colors carry compassionate intentions (Tucci, 2001; Seppälä et al., 2017)
- Dissolution releases blessings, teaches impermanence (Van Gordon, Shonin and Garcia-Campayo, 2017)

Loving-Kindness Meditation (LKM)

LKM rooted in Buddhist tradition, cultivates unconditional warmth toward self and others (Graser and Stangier, 2018; Petrovic et al., 2024). Practitioners silently repeat phrases of goodwill, "May you be happy, may you be at peace", while progressively expanding the circle of compassion: from self to loved ones, to difficult persons, to all beings (Hofmann, Grossman and Hinton, 2011). Research demonstrates LKM's benefits for emotional wellbeing (Petrovic et al., 2024; Hofmann, Grossman and Hinton, 2011), yet many practitioners find its abstract nature challenging to sustain (Yordanova, 2020; Graser and Stangier, 2018). How LKM Foster Compassion:

- Phrases generate warmth toward self and others, especially significantly increase self-compassion [Graser and Stangier, 2018; Petrovic et al., 2024; Barlow and Long, 2023)
- Progressive structure enhances positive emotions across diverse populations (Graser and Stangier, 2018; Hofmann, Grossman and Hinton, 2011; Zeng et al.,2015)
- Visualization makes recipients tangible (Petrovic et al., 2024)
- Repeated practice rewires emotional responses (Klimecki et al.,2013)

Design Process

This study co-developed and assessed a new meditation platform utilizing existing literature review, expert consultation, iterative design, and empirical testing. This platform provides a ritual structure aligned to Tibetan mandala practice, infused within a compassion-cultivating framework (LKM).

Concept and Prototype (Phase 1)

Following traditional mandala practice

Our prototype reconstructs key phases of the traditional mandala rite while layering LKM into the creation phase. This ritual arc intentionally fuses cultural authenticity with interactional clarity, reflecting evidence that culturally anchored, embodied activities can deepen engagement in meditation technologies (Malaver Turbay, 2022).

1. Creation: Within the Tibetan Buddhist tradition, monks spend days or even weeks carefully arranging each colored grain of sand. Working from the center outward, they construct beautiful intricate geometric patterns as shown in figure 1.

2. Dissolution: Once the mandala is complete, a ritual is performed to sweep it into flowing water, which is a demonstration of the impermanence of all things, while

simultaneously scattering blessings throughout the world as shown in figure 2.

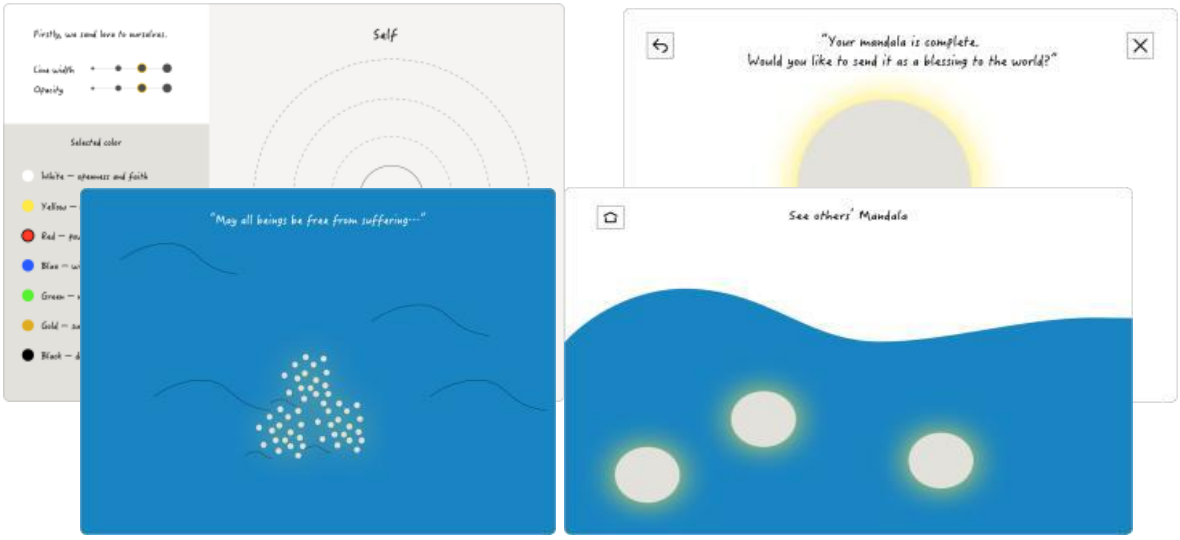


Figure 1: Creation: Users draw with sand while silently repeating LKM phrases matching each ring

Figure 2: Dissolution - Mandala disperses as grains into "River of Compassion"

Two Key Mechanisms

1. Color-Intention Mapping: Consistent with traditional Tibetan mandala color symbolism (Behrendt, 2024; Leidy and Thurman, 1997), the palette appears as selectable painting editor. Users choose and combine colors as they repeat phrases, making color a concrete token of the wish being generated , preserving cultural meaning while making LKM's goodwill intentions visible and cumulative.

2. Four Concentric Stages: The drawing surface comprises four concentric rings, each aligned with the canonical LKM progression (Hofmann, Grossman and Hinton, 2011; Salzberg and Kabat-Zinn, 2004; Fredrickson et al., 2008). Proceeding ring by ring mirrors both the inside-out growth of a mandala (Zeng et al.,2015; Klimecki et al., 2013) and the graded expansion of LKM (Hofmann, Grossman and Hinton, 2011; Salzberg and Kabat-Zinn, 2004), reducing abstraction by pairing every phrase set with a concrete, paced action.

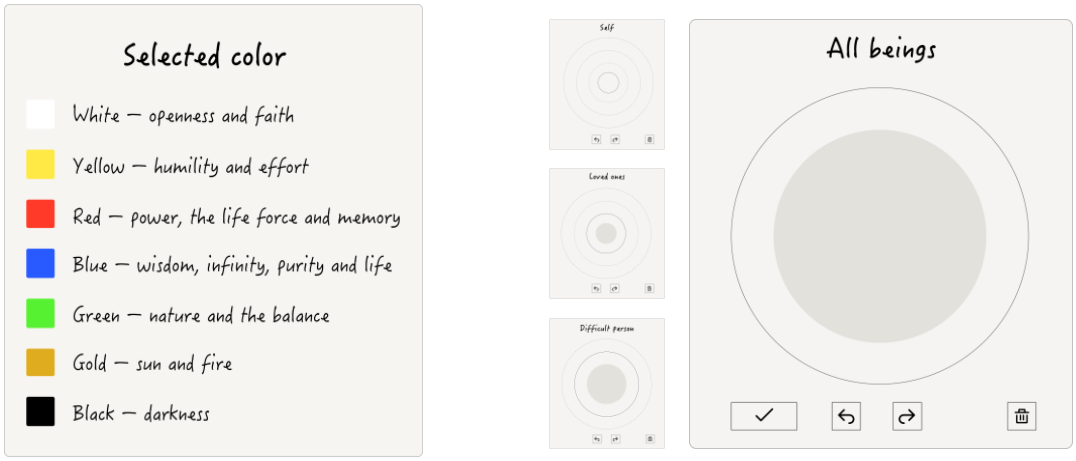


Figure 3: Color-Intention mapping and the concentric stages of drawing surface

Demo Development

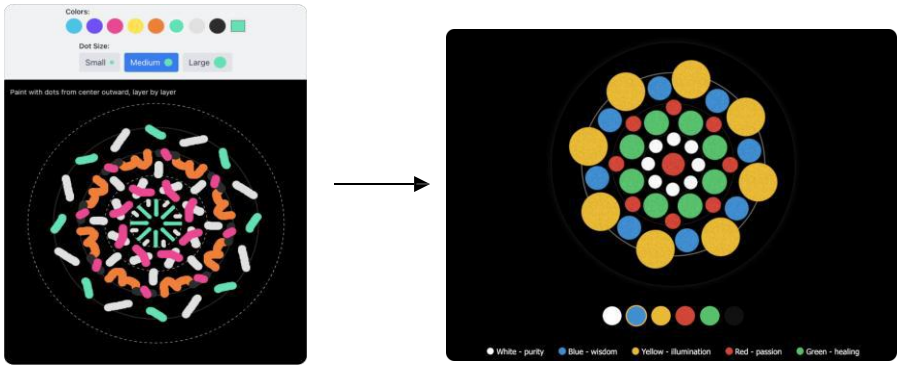


Figure 4: Before: "free-draw line" mode: Too fast and felt like graphic software -> After: "sand-dots" mode: Slow, deliberate, ritual feel. User press & hold and then sand dots slowly grow

Utilizing storyboards and design notes as prompts, we partnered with Claude AI to produce a working web prototype. This AI-assisted approach enabled rapid iteration focused on experiential quality rather than technical implementation. One of the main challenges of designing was the interaction way for drawing. In our first iteration, the mode of "free-draw" was perceived as very fast and looked very much like a graphic editor. During the iterations, we created the sand-dot mode, utilizing a press-and-hold interaction to gradually create grains with subtle light and speckled texture. This produces slowness and repetition essential to contemplative practice (Beerse, Van Lith and Stanwood, 2020; Van Lith, Beerse and Smalley, 2022).

Expert Interviews (Phase 2)

Insights from Buddhist Practitioners

Six experts (E01-E06) (Buddhist monks, meditation instructors, and mandala practitioners) shared insights through semi-structured interviews (30-60 min via Zoom/email). Thematic analysis revealed five design guides.

Design Guide 1: Connecting tradition and technology beyond mere formality.

The mandala should be the main activity (not just decoration). Keep the full ritual steps and maintain a slow, hands-on pace.

E01: “Engaging toward the young generations through the technology visually they can do kind of meditations.”

E03:“I like the interactive elements of creating the mandala I appreciate the ease of creating the mandala in the app.”

E04: “When I think of mandala creation it is very elaborate, intricate, labor-intensive one of the most complete and embodied practices.”

Design Guide 2: Making compassion tangible, actionable, and progressive.

Compassion grows when goodwill is enacted. It also grows when temporary solutions sustain difficulties.

E02: “Making a visual representation of one’s aspirations for kindness and compassion is the first step. Sending it out is the next step…”

E04: “You breathe in the suffering of others, transform it into compassion, and then breathe it back out.”

E01: “Okay, I have a jealousy rejoicement is the

only tool [that] can defeat the jealousy.”

Design Guide 3: A clear symbolic system with room for personal interpretation.

Employ a simplified color palette rooted in tradition. Allow gentle personalization while avoiding semantic overload.

E03: “I see where there is no color for compassion. I would think white is wisdom, light pink is compassion.”

E06: “The lotus and a more personal symbol has been still water. When water is still, you can see the bottom clearly.”

E01: “It’s important to identify the Buddha palace

or center-surround logic in mandala structure”

Design Guide 4: Embrace distraction, provide guiding anchors.

Distraction is normal during meditation practice. Serve and optimize attention anchors offering brief guidance.

E01: “They meditate try to focus and suddenly the mind goes somewhere else. We often talk about how we can bring it back.”

E05: “Be patient with yourself go back to the object not judging the object avoid [over-]conceptual analysis.”

E01: “When you have anxiety first. What is the cause. If I can fix it, fix it; if I can-not, what is needful in worry? move on.”

Design Guide 5: User support through structural frameworks and cultural context.

Users require clear structures, adjustable guidance, cultural annotations, and private, non-competitive habit-building support.

E05: “I don’t really understand what it represents. Why would healing green be assigned to that circle. This seems a little bit arbitrary.”

E04: “Counting mantra in public can be performative… an app… where you press as you recite and it records the numbers. So you don’t have to be conscious of your numbers.”

E06: “It’s cute and I like it! Maybe tips on how to be more compassionate and mindful—text pop ups that don’t get in the way.”

Redesign and Development (Phase 3)

Visual Blueprint - Setting the Mood & Style

Based on expert feedback emphasizing cultural authenticity and contemplative atmosphere, we made several modifications to create a warmer and a more culturally grounded visual experience.

- Emotional color journey Each meditation stage uses distinct emotional color tones to suggest the transformation of the meditation objects and the shift in the meditator's emotional state.

- Context backgrounds to establish a connection between digital interface and contemplative reality, the redesign incorporates high-quality, low-distraction real photographs as contextual backgrounds, while strictly controlling visual noise to avoid disrupting meditative focus.

- Clearer UI language and layout - Shifted from high-contrast black/yellow to softer gradients with clearer visual hierarchy. All UI elements use universal symbols + concise text, placed in low-distraction zones to enable "navigation without thinking."

- Background Music - This redesign offers optional background music and minimalist sounds to create an immersive atmosphere for the user; however, for those who prefer silence, the default volume is low but can be completely muted without affecting the user's experience.

Flow-level Redesign – Restructuring the Journey

Based on expert feedback emphasizing the importance of preparation and integration in meditation practice, we restructured the user journey from 3 steps to 6 steps, adding dedicated phases for settling attention and consolidating experience. Design research on digital mindfulness interventions consistently identifies preparation phases and reflection pauses as critical for novice practitioners who need scaffolding to transition into and out of contemplative states (Kelly et al., 2022; Döllinger, Wienrich and Latoschik, 2021).

- Cultural and Operational Onboarding - For first timers, there is a skippable brief guide, reducing confusion while showing respect for mandala cultural tradition. Cultural card: What is a mandala and its significance. Operational card 1: What is a "sand- dot" and how it works. Operational card 2: Try it now, hands-on practice before beginning.

- Prepare-then-Create Rhythm - Changed from the original design where prompts and drawing appeared on the same page to a "settle first → then draw" rhythm arrangement. Before each ring is drawn, the interface provides guided text for the compassion target and a breathing ring to briefly settle attention. During drawing, no voice or text interrupts. Only ambient sound of music continues to play.

- Five-breath Reflection - After completing each drawing stage, users enter a five-breath reflection pause. Users quietly gaze at their completed mandala, then re-visit and consolidate their goodwill toward their compassion objects before. This creates a three-part closed loop: Action -> Experience -> Internalization

Interaction-level Details Refinement

Small interaction choices profoundly shape the contemplative quality of digital meditation. Based on expert guidance about attention anchoring, acceptance, and reducing performance anxiety, we refined key micro-interactions.

- Add breathing ring animation - Embedded gentle "breathing ring" animations on preparation and reflection pages. The ring expands and contracts with a soft, slow

rhythm. It servs as a non-intrusive attention anchor that guides users back to breathe without verbal instruction. Research shows that visual breathing cues re-duce mind wandering and help focus on the present moment (Rockstroh, Blum and Göritz, 2021).

- Color information changed from ‘display’ to ‘tooltips’ Changed color meanings from an always-visible legend to tap/long-press tooltips. Clicking or long-pressing a color dot reveals its brief meaning (e.g., "Pure White — Clarity and new beginnings"). This maintains semantic clarity while avoiding information overload on the drawing canvas. Stress-reducing and guiding messages Two prompts were added to the drawing page to reduce performance pressure and encourage authentic expression.

- No Undo Button - Removed delete and undo options entirely from the drawing interface. This encourages users to "accept the imperfection of each placement," and keep attention on breath and rhythm rather than perfectionism. This design aligns with the ritual logic of impermanence: what is placed is released, not corrected. This reflects mindfulness principles of acceptance and non-judgment (Wielgosz et al., 2013).

- Positive feedback and ritualized closure - Upon completing each stage, users receive varied positive affirmations: "Excellent," "Good job," "Wonderful”. This feedback acknowledges progress. After dissolution into the river, a final closing message appears which consolidates positive experience and encourages a mindful pause before exiting.

User Testing, Results & Analysis (Phase 4)

A total of 37 graduate and undergraduate students were recruited from a Midwestern educational institution for the user testing phase. The study recruitment information was distributed through flyers, sent electronically to an internal student mailing list. The user testing sessions were completed online using a Qualtrics form. Each online session included signing a consent form, completing a pre-test questionnaire, testing the prototype , and submitting a post-test questionnaire. Session participants evaluated the prototype using State Self-Compassion Scale (SSCS-L) for self-compassion (Neff et al., 2021) which is a validated measure derived from extensive research on self-compassion interventions (Neff and Germer, 2013); And responded to the System Usability Scale (SUS) for usability (Bangor, Kortum and Miller, 2009), supplemented by open-ended questions about user experience. The average session time lasted for 16.1 minutes. Of the total 37 participants, two participants did not complete the session, and one participant’s response indicated data invalidity (participation time < 3 minutes). After excluding these incomplete responses, 34 responses were used for the data analysis.

Quantitative Results

For the SSCS-L analysis, we calculated the mean scores of the six subscales (Kindness, Self-judgment (reverse), Common humanity, Isolation (reverse), Mindfulness,

and Over-identification (reverse)), and the total score (the mean of the subscale scores). Higher scores indicate higher levels of self-compassion. A paired-samples t-test was used to compare changes in self-compassion levels before and after using the Mandala-LKM application.

The mandala-integrated LKM prototype produced significant improvement in self-compassion scores (SSCS-L mean score: 9.99 → 11.21; $p < .001$; $d = 0.98$). Effects were particularly strong on negative emotion subscales (self-judgment, over-identification, and isolation), indicating substantial reductions in self-criticism and emotional overwhelm. Specific descriptive statistics are shown in tables 1 & 2.

	Mean	SD	Max	Q3	Median	Q1	Min
Pre-test	9.99	1.57	13.17	11.33	9.75	9	6.67
Post-test	11.21	1.57	14.17	12	11.08	10	8

Table 1. Descriptive Statistics for SSCS-L Total Scores

For the subscale analysis:

- Self-Judgment showed the strongest improvement (Pre: $M = 8.97$, $SD = 2.63$; Post: $M = 7.15$, $SD = 2.28$), with a significant reduction in self-critical thoughts, $t(33) = -4.37$, $p < .05$, $d = 0.75$ (medium-large effect).
- Over-Identification demonstrated similar robust change (Pre: $M = 8.71$, $SD = 2.24$; Post: $M = 7.06$, $SD = 2.42$), indicating decreased rumination and emotional overwhelm, $t(33) = -4.19$, $p < .05$, $d = 0.72$ (medium effect).
- Isolation also improved significantly (Pre: $M = 7.44$, $SD = 2.86$; Post: $M = 6.18$, $SD = 2.56$), suggesting participants felt less alone in their suffering, $t(33) = -3.41$, $p < .05$, $d = 0.58$ (medium effect).

Subscale	Pre-test M (SD)	Post-test M (SD)	Difference M (SD)	t-value	p-value	Cohen's d
Kindness (positive)	10.18 (2.59)	11.56 (2.15)	2.15 (3.29)	3.8103	0.0005746	0.6535
Self-judgement (negative)	8.97 (2.63)	7.15 (2.28)	-1.82 (2.43)	-4.3748	0.0001148	0.7503
Common humanity (positive)	10.65 (1.95)	10.98 (2.40)	0.32 (2.08)	0.9048	0.3721	0.1552
Isolation (negative)	7.44 (2.86)	6.18 (2.56)	-1.26 (2.16)	-3.41	0.0008727	0.5843
Mindfulness (positive)	10.21 (2.11)	11.09 (2.31)	0.88 (2.09)	2.467	0.01899	0.4231
Over-identification (negative)	8.71 (2.24)	7.06 (2.42)	- 1.65 (2.30)	-4.1853	0.0001983	0.7178

Table 2. Statistical Analysis for SSCS-L Subscale Scores

- Kindness increased significantly (Pre: M = 10.18, SD = 2.59; Post: M = 11.56, SD = 2.15), $t(33) = 3.81$, $p < .05$, $d = 0.65$ (medium effect), indicating enhanced self-directed warmth.
- Common Humanity showed non-significant trends toward improvement ($p = .372$), with small effect sizes ($d = 0.16$).
- Mindfulness showed increased significantly ($p = .019$), with small effect sizes ($d = 0.42$).

The System Usability Scale ratings (M = 73.9, SD = 18.1) were in the “good” range of the adjective range scale (Bangor et. al, 2009).

Qualitative Results

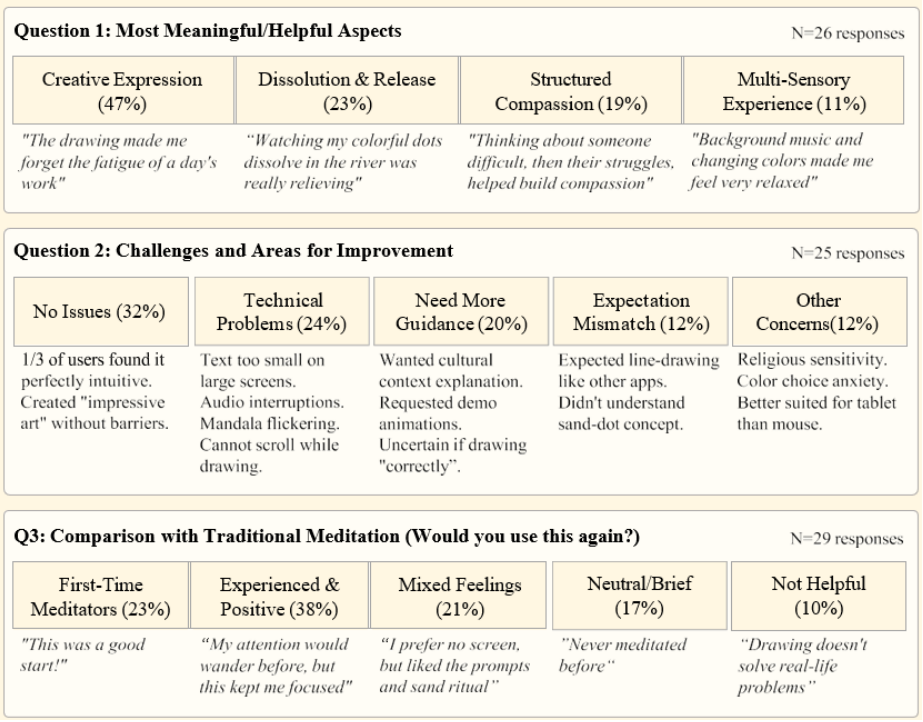


Figure 5: Qualitative analysis of open-ended questions

Discussion

This design journey revealed that cultural integration enhances digital meditation through structural scaffolding rather than surface aesthetics. This finding aligns with emerging evidence that digital mindfulness tools are most effective when they support coherent contemplative journeys rather than isolated relaxation exercises (Lukoff et al., 2020). The complete ritual cycle from creation through dedication to dissolution provides narrative closure that isolated mindfulness exercises often lack. Users do not simply draw; they enact a contemplative arc with clear beginning, intention-setting, and release. Mandala creation transforms abstract LKM into tangible form: participants watch their compassion take visible shape across four rings representing self, loved ones, difficult persons, and all beings. The dissolution ritual facilitates genuine psychological release—participants described watching colorful dots dissolve into the river as "really relieving," suggesting that symbolic release can support emotional letting-go. The particularly strong effects on negative self-perception subscales (self-judgment, over-identification, isolation) suggest that creative expression offers a gentle, indirect pathway for processing difficult emotions. Systematic reviews of mandala-based interventions in clinical populations confirm that externalization through visual creation helps reduce rumination and supports emotional processing (Zhang, Liu and Huang, 2024). Users externalize their patterns onto the canvas and then release them, rather than ruminating internally.

Implications & Take-aways

For meditation app designers, complete ritual cycles matter more than polished visuals; cultural context works best embedded within practice, not as separate information. For researchers, our expert-informed iterative approach offers a replicable framework for culturally grounded design. For practitioners, visual creation provides constructive outlets while structured frameworks guide without constraining personal expression.

Limitations and Future Work

Several limitations exist regarding the current study. Since subjects were recruited from a single university, generalizability across different demographics is limited. Also, because the study was conducted over only one session, it is impossible to know if the improvements observed with regard to self-compassion were maintained after the session. Additionally, because there was no control group with which to compare, it is not possible to definitively say if the cultural integration caused the improvements observed or if it was due to the practice of meditation itself. Finally, as a result of offering the instruction only in English, several nuanced elements of Buddhist philosophy may have been lost in translation. These limitations point toward future directions: controlled studies isolating cultural integration effects, longitudinal research tracking sustained impact, and mechanism analyses identifying which design elements (ritual structure, creative expression, or dissolution) most strongly drive self-compassion change. Beyond methodological refinement, social features such as community mandalas offer exciting possibilities for collective compassion practice in digital spaces.

Conclusion

Through this design journey, we presented study findings as initial evidence that integrating traditional Tibetan mandala rituals into digital LKM can enhance self-compassion outcomes. Our work contributes five expert-informed design guidelines and empirical evidence (N=34, d=0.98), showing potential for reducing negative self-perceptions. The insights provide a replicable framework for culturally grounded contemplative technology design - one that treats ritual structure, symbolic meaning, and creative expression as essential design materials rather than decorative additions.

AI Acknowledgement

Claude AI was used to prototype the web interface based on storyboards and design prompts.

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