

# EXPLORESELF: Fostering User-driven Exploration and Reflection on Personal Challenges with Adaptive Guidance by Large Language Models

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**A Exploration page**

The Exploration page displays a narrative about challenges and provides adaptive guidance through keywords and comments.

- a Theme panel:** Shows themes like "Overwhelmed by new responsibilities".
- b Question thread:** A discussion thread with a question: "Q. In what ways could you possibly incorporate your hobbies or self-development activities into your current routine?"
- c Guide keywords:** AI-generated keywords like "flexibility" and "support network".
- d Guide comment:** A comment suggesting connecting with older adults for support.
- e Explore Other Themes:** A button to explore more themes.

**B Theme selection dialog**

This dialog shows pinned themes and allows users to archive them for later.

- f Overwhelmed by new responsibilities:** A pinned theme.
- g Struggle with purposelessness:** Another pinned theme.
- h Archive themes to revisit later:** A button to archive themes.
- i Write Response:** A button to write a response to a selected theme.

**C Question selection for a new theme**

This section shows questions for a new theme.

- Overwhelmed by new responsibilities:** Questions include "Choose one of the questions from the list below to think about." and "In what ways could you possibly incorporate your hobbies or self-development activities into your current routine?"
- Get More Question Suggestions:** A button to get more suggestions.
- Write Response:** A button to write a response.

**Figure 1: EXPLORESELF supports user-driven exploration and reflection on their personal challenges. People can explore diverse perspectives through themes ④ related to their initial narratives and reflect on details aspects through question threads ⑤. As adaptive guidance, the system provides AI-generated keywords ③ and comments ④ that people can refer to while writing an answer. People take the initiative of the exploration by proactively selecting themes ② and questions ③.**

## Abstract

Expressing stressful experiences in words is proven to improve mental and physical health, but individuals often disengage with

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writing interventions as they struggle to organize their thoughts and emotions. Reflective prompts have been used to provide direction, and large language models (LLMs) have demonstrated the potential to provide tailored guidance. Current systems often limit users' flexibility to direct their reflections. We thus present EXPLORESELF, an LLM-driven application designed to empower users to control their reflective journey. EXPLORESELF allows users to

receive adaptive support through dynamically generated questions. Through an exploratory study with 19 participants, we examine how participants explore and reflect on personal challenges using EXPLORESELF. Our findings demonstrate that participants valued the flexible navigation of adaptive guidance to control their reflective journey, leading to deeper engagement and insight. Building on our findings, we discuss the implications of designing LLM-driven tools that facilitate user-driven and effective reflection of personal challenges.

## CCS Concepts

- Human-centered computing → Interactive systems and tools; Empirical studies in HCI.

## Keywords

Reflective Writing, Technology for Well-being, User-driven Exploration, User Agency, Large Language Models

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## 1 Introduction

Articulating stressful or emotional experiences in words has been found to improve both physical and mental health by enabling individuals to process and express their thoughts and emotions [5, 76, 77]. It has been a widely circulated and popular means for individuals to self-reflect and make sense of themselves [23, 33], by simply sitting down to write the innermost thoughts and feelings without confines of grammar, punctuation, or any other formalities of written composition. However, writing about negative experiences and thoughts can be challenging as it often requires individuals to confront distressing thoughts and emotions, making it tempting for them to disengage from the process [77, 91]. Hence, there have been a number of adjustments to the activity to help with this process. For example, tools like self-help workbooks and prompted journaling have been developed to offer structured prompts that guide users in exploring their thoughts and emotions [66, 81]. The HCI community has also introduced interactive methods, such as using photos as journaling prompts [39] or employing a conversational assistant with sequences of probing questions [73]. These approaches mostly involved pre-defined prompts for writers to use, which has proven effective to spark thinking and dive into the process [18, 41]. It has also been noted that these prompts are inflexible and detached from the user context [7].

The generative capabilities of recent large language models (LLMs) have accelerated the advancement of intelligent writing support tools [51, 52], which commonly perform natural language generation for directly modifying the content (e.g., [44, 52]) or providing advice for improving the content (e.g., [24]). However, research on LLM-driven writing tools largely focuses on creative writing, and only a handful of works have recently begun to study intelligent support for writing about the self (e.g., DiaryMate [44]).

Further, a growing body of research has investigated the LLMs' potential for mental health support in the form of conventional chat interfaces (e.g., [43, 48, 87, 94]). Although LLM-driven, open-ended conversations are intuitively analogous to therapists' counseling sessions, an agent who holds the therapist's persona tends to lead the conversation and sometimes can result in unintentional reinforcement of negative narratives [35, 43, 94]. Meanwhile, research suggests that when individuals are able to make choices and exert control over their experiences, they engage more meaningfully in the process and develop a stronger sense of ownership and responsibility for their growth [20].

In this work, we investigate ways to empower individuals to take greater control of the reflective process of their personal challenges while simultaneously leveraging the personalized and adaptive guidance offered by LLMs. To this aim, we designed and developed EXPLORESELF, an LLM-infused interactive system for exploring and reflecting on personal challenges. EXPLORESELF allows users to freely expand related themes from the initial narrative and drill down probing questions to reflect on aspects of themes in depth. To facilitate exploration, the system provides on-demand guidance, such as prompting keywords and comments tailored to their writing. The design of EXPLORESELF was informed by formative interviews with nine mental health professionals, where their challenges and approaches to managing the counseling sessions inspired our interface design and the generative pipelines.

To understand how people interact and engage with EXPLORESELF in exploring their personal challenges, we conducted an online lab study with 19 individuals, where they explored their personal challenges using EXPLORESELF for 30 to 60 minutes. Through user-directed exploration with diverse forms of adaptive guidance by LLMs, EXPLORESELF enabled individuals to engage in meaningful self-reflection while maintaining control over the direction of their reflection. Participants actively leveraged the navigation components (*i.e.*, themes, questions, and summary) and the adaptive guidance (*i.e.*, keywords, and comments) in individualized patterns. Participants' perceived agency was significantly increased after the session. Participants reported that the system's adaptive features, such as the ability to select themes, choose from multiple Socratic questions, and toggle keywords and comments, contributed to their sense of control and autonomy. Participants decided which aspects to focus on or revisit later in a way that balances their cognitive and emotional effort with the expected significance of the engagement regarding their personal concerns. Drawing on the findings, we discuss how the components of EXPLORESELF collectively fostered a dynamic and personalized reflective process, helping people feel more empowered in navigating their personal challenges.

The key contributions of this work are threefold:

- (1) The design and implementation of EXPLORESELF, a novel LLM-driven web application that supports guided writing about breakdown topics regarding a personal issue, encouraging sense-making and refreshment of thoughts on it. EXPLORESELF's design was informed by formative interviews ( $N = 9$ ) with clinical psychologists and professional licensed counselors.
- (2) An empirical study using EXPLORESELF, with 19 individuals with varied severity and types of personal issues. From the quantitative and qualitative analysis, we provide an understanding of

how people elaborate thoughts and make sense of their own issues through interactive reflection aided by adaptive guidance. We uncover how participants balanced exploration and reflection, engaging with AI-driven themes, questions, keywords, and comments, and offer insights into their perspectives on these forms of guidance.

- (3) Implications for designing LLM-driven tools that facilitate user-driven and effective reflection of personal challenges.

## 2 Related Work

In this section, we cover the related work in the areas of (1) writing for well-being and (2) technology-mediated writing for well-being.

### 2.1 Writing for Well-being

A substantial body of research has demonstrated that the act of writing as an instrument for exploring personal thoughts and emotions can promote self-healing and personal growth, significantly enhancing both physical and emotional well-being [5, 76, 77]. It has been widely studied across diverse contexts, including expressive writing from social psychology [77, 83], integration into specific psychotherapies as a treatment (e.g., guided autobiography, using diary in CBT), positive interventions to promote psychological well-being (e.g., writing about gratitude and forgiveness), and through personal practices [83]. One of the most widely researched methods is expressive writing, which involves writing about one's deepest thoughts and feelings regarding stressful experiences [77]. Across these various writing for well-being practices, the common focus lies in translating personal experiences into written language, allowing individuals to process and organize their thoughts and feelings in a meaningful way [76–78, 83].

Through this process, individuals often derive meaning from stressful events and foster a sense of hope as they work through their emotions and gain new perspectives [29]. This activity has been shown to yield significant benefits for individuals across various demographics, including different age groups [47, 97], gender [59], cross-cultures [21, 45], and health conditions [56, 82]. Studies have also found that writing can be beneficial for well-being when people engage in writing outside of controlled laboratory settings, such as at home or online [54]. While several theories attempt to explain the connection between expressive writing and health, no single mechanism has emerged as dominant, likely due to the varied experiences and expectations of participants [50]. However, studies from psychology have suggested that writing allows individuals to release suppressed emotions [53], gain deeper insights into their experiences [76], and develop a sense of control over their thoughts and emotions through self-reflection and emotion regulation [53]. In this way, writing can be used intentionally and purposefully to foster self-discovery, emotional growth, and personal insight, enabling individuals to gain a deeper understanding of themselves and their experiences [1, 80, 96].

Research from psychology has indicated that writing about stressful events demands a significant level of perceived control, as it helps individuals organize, connect, and contextualize their thoughts and emotions [2, 27]. This sense of control is not only essential for initiating or sustaining a writing practice but is also closely tied to physical and psychological well-being, making it a

core component of the writing process itself [2]. To support individuals in maintaining a sense of control, structured guidance has been studied as an effective tool to reduce cognitive load and alleviate the overwhelm that often accompanies reflection. Prompts and reflection frameworks are amongst the popularly studied tools for offering that sense of control, offering a sense of direction or goal to writers. In this way, individuals can navigate their thoughts and emotions in a more organized way, providing manageable steps to follow rather than leaving them to explore themselves entirely on their own. This approach supports sustained engagement by making the process more approachable and less overwhelming [6, 16]. Previous research has explored various methods for designing such structure, including gratitude-focused writing [25], writing in a narrative structure [17], using sentence stems (e.g., “*The thing I am most worried about is...*”), journaling with photographs [68], and mind maps [17, 96]. While these approaches offer helpful starting points, they are often provided in a fixed format, usually requiring the individual to stay on a structured course throughout, therefore they cannot respond to the writer’s thoughts and feelings that evolve in writing. This limits their ability to provide adaptive feedback or tailored suggestions to the individual’s unique emotional states and goals in writing. Recognizing this gap, recent works have explored more dynamic, interactive methods that provide personalized prompts, real-time feedback, and adaptive support [37, 63, 98].

### 2.2 Technology-Mediated Writing for Well-being

With the soaring number of digital writing tools, individuals increasingly engage in writing for well-being using these tools, such as on online health platforms and digital journaling tools, to motivate themselves to engage in writing for well-being [57, 92]. These spontaneous, technology-mediated practices provide a space for self-expression and reflection, yet users often face challenges in maintaining consistent engagement and fostering deeper introspection. In response, the HCI community has explored methods to support individuals in their reflective writing journeys, focusing on strategies to enhance engagement by introducing the social presence of chatbots [73] and providing contextual data to aid reflection [31]. These approaches have aimed to create structured yet flexible systems that guide users in navigating their thoughts and emotions more effectively.

The generative capabilities of LLMs (e.g., GPT [10], Gemini [95], Claude [3], HyperCLOVA [42]) have motivated the development of flexible and adaptive support for writing for well-being (e.g., [43, 44, 69, 89, 101]), offering personalized interactions that acknowledge and are responsive to what users write. For example, Kim *et al.* explored the potential of interactive dialogue with LLMs as an alternative format for reflective journaling for psychiatric patients, where LLM chatbots provided adaptive reflective questions [43]. Their findings demonstrated that these adaptive prompts benefited individuals by helping them explore and reflect on their past experiences and emotions. However, since interactions with LLMs are naturally and intuitively conversational in nature, many LLM-driven approaches let users “chat” with an AI agent rather than write [35, 43, 72, 94]. Conventional turn-taking structure in chat inherently confines users to respond to the agent’s last message,

and such linearly progressing dialogues limit the flexibility to pivot subjects or grasp the landscape of the conversation. This makes the user's thought process heavily influenced by the performance and behavioral design of the AI agent, introducing a risk of triggering negative reinforcement [12, 58, 74, 102].

Research suggests that when individuals are given the freedom to make choices and exercise control over their reflective processes, they tend to experience deeper engagement driven by intrinsic motivation [75]. This autonomy fosters a stronger sense of ownership over their personal growth, increasing their responsibility for and investment in the outcomes of their reflection [20, 22, 60, 75, 84]. Recently in HCI, self-guided tools have been studied in the context of therapeutic intervention (e.g., [88, 89]), allowing individuals to engage with LLM-driven systems to reframe negative patterns of thinking. These systems aim to improve the accessibility and effectiveness of interventions by guiding users through well-established tasks, such as identifying cognitive distortions and reframing, with the LLM providing adaptive support throughout the cognitively and emotionally demanding process. However, while such predefined therapeutic modules provide focused support, in this case on correcting cognitive distortions, these systems may still keep the users from exploring the freely flowing thoughts and feelings of users and coming to a resolution or new self-insight on their own. In this work, we are interested in designing an LLM-driven writing for well-being activity that can preserve user agency throughout the reflection process while still providing adaptive support. Striking this balance between guidance and autonomy is crucial, and we turn to formative studies where we explore ways to integrate adaptive LLM support within the context of users' own reflective journey.

### 3 Formative Interviews

To inform the design of EXPLORESELF, we conducted semi-structured interviews with mental health professionals, whose main role is to guide individuals in exploring and addressing their personal challenges. By understanding their underlying strategies and expertise, we aimed to gain a nuanced understanding of the challenges of providing effective guidance, which in turn informs the key considerations for designing an interface that incorporates therapeutic principles for its guidance, as well as to obtain insights into the potential and proper role of AI.

### 3.1 Procedure and Analysis

We recruited nine experts (E1–9; see Table 1) through snowball sampling and internal network, who have extensive experience in clinical psychology and professional counseling. Participants comprised five clinical psychologists, three licensed therapists, and one psychiatrist. Five were based in South Korea, three in the United States, and one had experience working across the US and the UK. Participants had an average of 15.11 years (ranged 5 to 26) of experience in mental health care. Each interview lasted about one hour and was conducted in person or remotely, depending on the participants' availability. We compensated participants with 100,000 KRW or 100 USD, depending on their residence.

The interviews covered participants' strategies for helping clients navigate personal challenges, typical difficulties clients face, and potential roles they envision for LLM-driven systems in the therapeutic process. To elicit their feedback, we presented the experts with an example of a personal challenge and asked them to describe how they would approach such a case, including how they might guide the client through the process. Additionally, we presented a paper prototype of an LLM-driven guided writing where the system suggests related topics based on the initial problem narrative the user wrote. We asked for participants' feedback on its potential utility and areas for improvement.

All interviews were audio-recorded and transcribed for analysis. Employing thematic analysis [9], one researcher coded transcripts and grouped them into broader themes. The research team iterated several rounds of discussion to refine themes. In the following, we cover the findings from the interviews.

### 3.2 Findings

**Importance of Guided Exploration in Addressing Individual Needs.** Participants highlighted the essential role of therapists in tailoring guidance to explore the unique needs of clients. E8 noted, “*When clients first enter therapy, they typically have a vague desire to ‘feel better’ but struggle to articulate specific goals.*” To address such ambiguity, therapists often start conversations to help clients clarify their objectives and understand the underlying issues they need to address. This process not only sets effective goals for the therapy but also empowers clients to gain a clearer understanding of their own difficulties. To guide their clients, all participants commonly used a strategy of asking a series of focused, open-ended questions to encourage self-reflection. E2 shared that she often encourages

**Table 1: Demographic information of the experts participated in our formative study.**

Alias	Job title	Years of experience	Country of experience
E1	Licensed counselor	16 years	South Korea
E2	Clinical psychologist	26 years	South Korea
E3	Licensed counselor	15 years	South Korea
E4	Licensed counselor	17 years	South Korea
E5	Psychiatrist	18 years	South Korea
E6	Clinical psychologist	20 years	United States, United Kingdom
E7	Clinical psychologist	11 years	United States
E8	Clinical psychologist	5 years	United States
E9	Clinical psychologist	8 years	United States

clients to write about their issues between sessions, but many times, they struggle to decide what topic to write about. E2 remarked, “*I might suggest they write about certain things that arise from our collaborative exploration and give them specific assignments.*”

**Challenges in Effective Questioning during Conversations.** All participants highlighted the challenges of asking adequate questions that the client would be ready to accept and explore. E6 noted, “*If I ask certain questions too early, the client might push back, thinking I'm making assumptions,*” emphasizing that clients should feel understood and supported, rather than overwhelmed or led in a direction they are not prepared to explore. Similarly, E4 mentioned, “*My biggest challenge is with clients who don't have much to say—they may shut down or resist answering. In these cases, I often have to find alternative questions or pathways to re-engage them.*” Participants pointed out that there is no holy grail when it comes to the sequence of questions, and therefore, the effectiveness of any therapeutic approach depends largely on the therapist’s ability to decide when and what the client would find it acceptable.

**Guidance to Enhance Awareness of the Process.** Participants emphasized the importance of keeping clients informed about the the status of the current therapeutic conversation, in part to stay focused and to prevent them from feeling overwhelmed or lost in their thoughts. They also noted that understanding the flow of the session and the broader discussions context helps clients construct coherent narratives and stay engaged in their own problems. For those struggling with ruminative thinking, where thoughts can circle back repeatedly without recognizing the broader context, these reminders become particularly important: E1 noted, “*They often don't realize they're going in circles until I reflect back on what they have said, which helps them recognize the pattern.*” E4 mentioned that she uses visual aids during sessions by writing down key themes or keywords as the conversation progresses.

## 4 EXPLORESELF

In this section, we first cover the design rationales we derived from prior literature and the formative study. We then describe the system design and user interfaces of EXPLORESELF and implementation details, including the generative pipelines.

### 4.1 Design Rationales

**DR1. Provide diverse pathways to foster user agency and deep reflection.** Recognizing that individuals may explore their thoughts through various cognitive pathways, it is crucial to foster flexible thinking and support a sense of autonomy in the reflective process [19, 40, 90]. In our formative study, professionals emphasized the importance of allowing clients to control their own reflective journeys. Therapists adjust their questions based on the client’s responses and collaboratively identify topics to prioritize for deeper exploration. Therefore, we designed EXPLORESELF to provide a rich resource that enables users to take the lead in shaping and guiding their reflective pathways. First, the EXPLORESELF generates “Themes”—potential areas of reflection—based on the initial narrative provided by the user. Second, once the user selects a theme, the system suggests multiple “Socratic questions” [15], an evidence-based approach that encourages critical thinking and self-reflection.

These questions prompt users to explore underlying emotions and perspectives that may not have surfaced in their initial narrative.

**DR2. Provide guidance to support expression without directing content.** In our formative study, professionals highlighted the usefulness of providing subtle guidance to help individuals articulate their thoughts and emotions. They emphasized that people often struggle with open-ended or thought-provoking questions, which can be cognitively overwhelming. In the context of writing for well-being, the benefit lies in the individual’s process of translating their experiences into language [77]. To preserve this, our system avoids directly shaping the content of users’ expressions (e.g. generating direct sentences for users to adopt [44]), instead offering scaffolding that gently supports the reflective process. To achieve this balance, we introduced features like “Keywords” and “Comments.” The keyword list offers users a subtle prompt by suggesting relevant concepts or terms that might help them think through a particular Socratic question, while still leaving room for their own interpretation. Additionally, the system generates comments that provide hints or feedback without making direct assertions about the user’s narrative.

**DR3. Provide a tangible summary of the progress.** In our formative study, professionals emphasized the importance of restating or summarizing client’s thoughts back to them, as this helps foster reflection by offering an objective perspective on the client’s experiences. They noted that while the summary might be subjective from the therapist’s viewpoint, it allows individuals to compare their internal thoughts with an external interpretation, serving as a valuable tool for stepping back and critically evaluating their journey. In line with this practice, we introduced the “AI Summary” feature, designed to offer users an objective summary of their reflections. The overview provides a synthesized narrative of the user’s themes, questions, and answers, reflecting the key points of their exploration.

### 4.2 System Design and User Interface

EXPLORESELF is designed to assist users in navigating, exploring, and making sense of personal challenges through writing with structured and adaptive guidance by an LLM. The application consists of three primary phases of user engagement: (1) *writing the initial narrative*, (2) *exploring the narrative*, and (3) *wrapping up and summarization*. Each phase was carefully designed to encourage different aspects of self-reflection on and understanding of the personal challenges, helping users process their thoughts and emotions effectively. In the following, we describe each phase and interactions through a usage scenario: *Jane is a retiree who looked forward to enjoying the freedom she earned after decades of hard work. She had plans to explore new hobbies and focus on self-development. However, her daughter asked Jane to care for her newborn during the daytime. Although Jane loves spending time with her grandson, she sometimes feels that her own life has become overshadowed by her new responsibilities. The freedom she anticipated seems out of reach, and she occasionally struggles with a sense of purposelessness, yearning for time to pursue her personal growth. Now that she turns to EXPLORESELF to process this challenge.*

**4.2.1 Writing the Initial Narrative.** Jane opens EXPLORESELF and the web page shows the *Initial Narrative* page (Figure 2-A), which prompts her to articulate her challenges. The interface presents a borderless text area encouraging Jane to write freely about what weighs on her mind and her thoughts and feelings associated with it (ⓐ in Figure 2-A). Jane jots down her story and clicks the ‘Start Exploration’ button (ⓑ in Figure 2-A), which sends her to the Exploration phase, where the system facilitates a more structured process of introspection and analysis.

**4.2.2 Exploring the Narrative.** The **Exploration** page (Figure 1-A) allows Jane to explore and reflect on her challenges by navigating both the breadth and depth of her narrative.

**Themes: Expanding breadth.** Jane clicks the ‘Explore Themes’ button (ⓐ in Figure 1-A), and it opens the **Theme Selection** modal dialog (Figure 1-B). The dialog lists two AI-generated themes related to her initial narrative: ‘Overwhelmed by new responsibilities’ and ‘Struggle with purposelessness.’ She would like to explore both themes but saves the second one for later by clicking the bookmark icon (ⓑ in Figure 1-B), which stores the theme in **Pinned Themes**. She then clicks the ‘Overwhelmed by new responsibilities’ theme (ⓕ in Figure 1-B). And a new **Theme panel** (Figure 1-C) appears on the main page.

**Question Threads: Expanding depth.** The theme panel lists three AI-generated Socratic questions that may encourage deeper reflection on the current theme. Of these questions Jane selects the first one: “In what ways could you possibly incorporate

your hobbies or self-development activities into your current routine?” (ⓐ in Figure 1-C) creating a new **Question panel** (ⓑ in Figure 1-A) on the theme panel. The question panel contains a text field to write down answers. Next to it, an **AI comment** (ⓓ in Figure 1-A) is generated, encouraging Jane to think about small pockets of time. To get more guidance for writing answers, Jane turns on the switch for the **Keyword list** (ⓔ in Figure 1-A) above the text field, which would reveal two relevant keywords, ‘flexibility’ and ‘support network.’ Inspired by the support network keyword, Jane jots down the idea of finding peer older adults who also care for grandkids to form a support network. She clicks the ‘See New Comment’ button (ⓐ in Figure 1-A) to refresh the comment, and the new comment acknowledges her answer. Jane goes on this thread of questions; she clicks the ‘Get More Question Suggestions’ button (Figure 1-C) on the current question panel, and the Theme panel generates three new questions based on her question and answer. She selects ‘How do you think finding a support network might impact your sense of overwhelming responsibility?’ that directly follows up her previous thread. She continues exploring the theme by creating and answering AI-driven questions.

Satisfied with the exploration of the ideas of the support network, Jane turns to a new theme. She again clicks the ‘Explore Other Themes’ button, and the Theme selection dialog suggests new themes generated considering her activities so far. However, no suggested themes inspire her. So Jane **creates her own theme**,

**A Initial narrative page**

Jot down Your Story of Difficulty

Everyone has their own difficulties. Feel free to write about any aspect of the difficult situation and the way you feel about it that comes to mind. Afterwards, AI will suggest various topics for you to think about regarding your difficulty, and through simple writing activities, it aims to help you better understand your worries and the thoughts surrounding them. Remember, all of your writing will be completely confidential.

I looked forward to enjoying the freedom I'd earned after decades of hard work. I had plans to explore new hobbies and focus on my self-development. However, my daughter asked me to care for her newborn during the daytime. While I love spending time with my grandson, I sometimes feel like my own life has become overshadowed by these new responsibilities. The freedom I anticipated seems out of reach, and I occasionally struggle with a sense of purposelessness, yearning for time to pursue my personal growth.

**a Written narrative**

**b Start Exploration**

**B AI Summary page**

**c Jane's Exploration History**

I looked forward to enjoying the freedom I'd earned after decades of hard work. I had plans to explore new hobbies and focus on my self-development. However, my daughter asked me to care for her newborn during the daytime. While I love spending time with my grandson, I sometimes feel like my own life has become overshadowed by these new responsibilities. The freedom I anticipated seems out of reach, and I occasionally struggle with a sense of purposelessness, yearning for time to pursue my personal growth.

**d AI Summary**

Jane embarked on a journey anticipating a newfound freedom after years of hard work, with intentions to explore new hobbies and self-development. However, her plans were disrupted when she took on the daytime care of her grandson at her daughter's request. Although Jane finds joy in teaching her grandson new skills and values the meaningfulness of their interactions, she feels that her personal life and growth are being overshadowed by these new responsibilities. Through her reflections, Jane identified that building a support network with other older adults in a similar situation could alleviate some of the overwhelming feelings. She believes that such a network would not only provide her with much-needed personal time but also offer emotional relief and a sense of community, helping her balance caring for her grandson while still pursuing her own interests.

**e View New Summary**

Through this exploration, what have you learned or newly realized about yourself and your situation? Feel free to write down whatever comes to mind.

**f Go back to the Exploration Page**

**End session**

**Q** In what ways could you possibly incorporate your hobbies or self-development activities into your current routine?

I might find other older adults who are also caring for their grandkids... Maybe they could be my support network.

**Q** How do you think finding a support network might impact your sense of overwhelming responsibility?

I think finding a support network could significantly reduce my sense of overwhelming responsibility. For example, if I had others to share caregiving duties with, even if it was just for a few hours a week, it would give me some much-needed personal time to focus on my own interests and recharge. Additionally, being able to talk with others who are in the same situation would provide emotional relief. Knowing that I'm not alone and that others understand what I'm going through could make me feel less isolated and more supported.

**Q** What are the aspects of spending time with your grandson that bring you joy and fulfillment?

**Figure 2: The Initial Narrative A and the AI Summary B pages of EXPLORESELF.** Writing the initial narrative Ⓛ is a starting point for providing the basis clues to the system. Clicking the ‘Start Exploration’ button Ⓜ leads to the Exploration page (Figure 1-A). People can move between the Exploration page and the AI Summary page B to overview their exploration history Ⓝ and the AI-generated summarization Ⓞ. The ‘View New Summary’ button Ⓟ generates a new summary.

"About grandson," by typing it on a text field on the Theme selector dialog, to reflect on her grandson. The new Theme panel suggests questions related to her custom theme, and Jane selects the question, "What are the aspects of spending time with your grandson that bring you joy and fulfillment?" Upon this question, her perspectives on caring for her grandson transitioned from being overshadowed to being fulfilled. She continues exploring through her challenging story by adding themes and questions. She also goes back to see past themes and her writing by clicking themes on the **Overview** list (Figure 1-**A**, top-left). After a while of exploration, Jane feels that her exploration is saturated. She clicks the 'View AI Summary' button (Figure 1-**A**, bottom-left) to wrap up the exploration.

**4.2.3 Wrapping Up and Summarization.** Jane enters the **AI Summary** screen (Figure 2-**B**). On the left column, she can review a comprehensive list of themes, questions, and answers (© in Figure 2-**B**). On the right column, an AI-generated summary is displayed (Ⓐ in Figure 2-**B**). The summary synthesizes the key themes and insights from the user's exploration into a concise essay. Using the back button (Ⓕ in Figure 2-**B**), she can also go back to the Exploration screen and return with updated exploration paths. Jane reads through the AI summary and ends the exploration.

### 4.3 Generative Pipelines

In this section, we describe the generative pipelines incorporated in EXPLORESELF to support the generation of themes, questions, keywords, comments, and summaries. Figure 3 illustrates the data flow and a gist of LLM instructions for each pipeline. The pipelines refer to the current exploration status (see Figure 3, left), including the initial narrative, themes, questions and answers, and keywords and comments selectively depending on the type of pipeline. The exploration status is inserted to the structured input instruction formatted in XML. The underlying LLMs run on instructions following the chain-of-thought prompting approach [100], where the model is instructed to provide meta-output (see thin texts in Figure 3, right), such as rationales of the output, along with the requested output to enhance the reliability of generation. We consistently applied a 'therapeutic assistant' persona to the instructions (see dark boxes in Figure 3, right) to better contextualize the generation [28, 99].

The **Theme Generation** step (Figure 3-**A**) identifies themes that arise from their personal narratives and previous interactions with the system. The model is instructed to name themes that are closely aligned with the user's language and expressions. In case the user does not grasp the meaning of the original theme name, the model also provides *alternative expressions* to allow the user reveal them on the Theme selector dialog (see Ⓛ in Figure 1-**B**). To further guide this behavior, we let the model clarify which part of the initial narrative each theme stems from (see the white box in Figure 3-**A**) (See Section A.1). The **Question Generation** step (Figure 3-**B**) suggests probing questions for a given theme. The model is instructed to craft socratic questions [15] that encourage users to navigate deeper into their thoughts and feelings. Each question is designed to resonate with the user's language and context (See Section A.2).

To further guide the user while reflecting on the questions, the system also provides **keywords** (Figure 3-**C**) and **comments** (Figure 3-**D**). When generating keywords, the model is instructed that the keywords should (1) serve as cognitive scaffolding, (2) activate potential blind spots for the user, and (3) be relevant to the user's background and core values (See Section A.3. As for the comments, the model is instructed to first decide the category of the comment from one of the predefined categories: (1) tips for approaching the question, (2) encouraging feedback, (3) sub-questions elaborated from the questions, (4) insightful comment, and (5) others (See Section A.4).

When generating **AI summary** (Figure 3-**E**), the pipeline synthesizes the user's themes, questions, and answers into an essay in several paragraphs. The model is instructed to generate a concise and focused story, using the user's own language and expressions where appropriate. The summary is intended to highlight key themes, emotions, and notable progress, offering a clear snapshot of the user's pathway of exploration. Also, the model tries to make the summary commensurate with the volume of the content of the user's writing, not extrapolating details and staying grounded in the user's actual input (See Section A.5).

### 4.4 Implementation

EXPLORESELF consists of (1) a backend server that manages user data and LLM pipelines and (2) a frontend web interface, both written in TypeScript [62]. The server runs on the Express.js [26] framework, providing core functionalities via REST APIs and storing the user data in MongoDB [64]. We implemented the LLM pipelines using LangChain.js [49] incorporating OpenAI [71]'s GPT-4 ChatCompletion API. As LLM's capabilities of dealing with non-English texts are inferior to equivalent English texts due to the inefficient tokenization [79], we chose gpt-4o<sup>1</sup> as an underlying model, which involved an improved Korean tokenizer with state-of-the-art performance. The web interface was implemented using React.js [61].

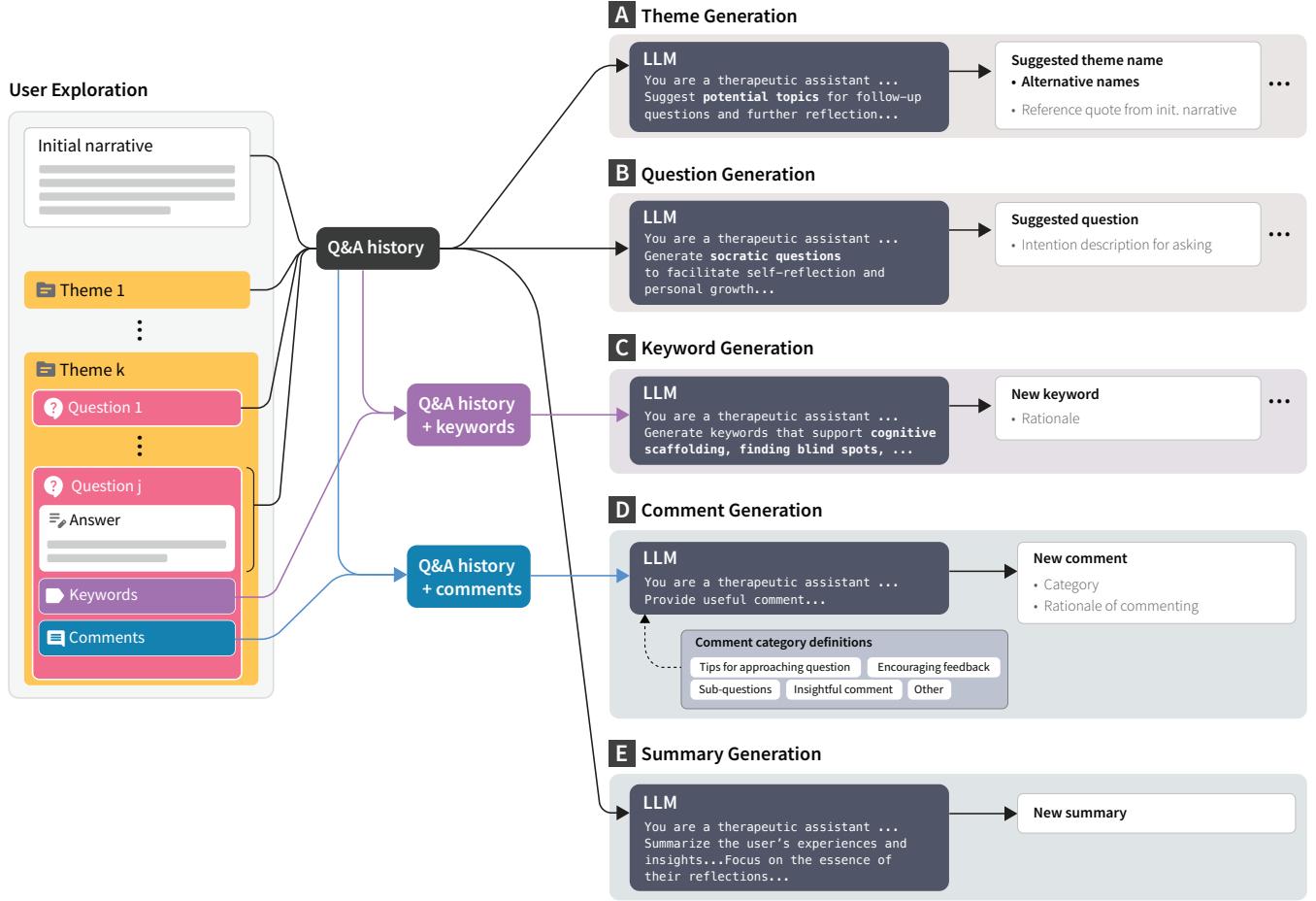
## 5 User Study

We conducted an exploratory study to examine how individuals interact with EXPLORESELF and how it may foster exploration and reflection on personal challenges. The study was conducted online via Zoom to ensure that participants could engage in the study in an environment of their choice, where they could feel most comfortable and secure. Conducting the study online allowed for greater flexibility in participation, enabling individuals to interact with EXPLORESELF at their own pace and in their preferred settings, which is known to lead to more authentic and reflective responses [32, 86]. Our study protocol was approved by the public institutional review board of the Ministry of Health and Welfare of South Korea prior to recruitment.

### 5.1 Participants

We recruited 19 participants (P1-19; 10 female) by advertising the study on a local social community platform and online university communities in South Korea. Our inclusion criteria were adults who (1) are 19 years old or older; (2) are native Korean speakers; (3) are currently staying in Korea; (4) can join an online study in

<sup>1</sup><https://openai.com/index/hello-gpt-4o/>



**Figure 3: The overview of pipelines to generate themes **A**, questions **B**, keywords **C**, comments **D**, and the summary synthesizing the exploration history **E** in the middle of exploration. Each generative pipeline incorporates an LLM inference that receives the current exploration history starting from the initial narrative as an input. The LLM inference is driven by chain-of-thought style instructions, providing descriptions and rationales for each output to enhance reliability.**

a private and comfortable place; and (5) are motivated to better understand their personal challenges. In particular, we ensured participants met criteria (2) and (3), (2) for them to be able to express their personal challenges in the most comfortable language as EXPLORESELF was implemented in Korean. (3) was to make sure the participants were in an accessible proximity, allowing them to engage in the study from a private space of their choosing, where they could write without researchers physically present while still being accessible for the study. Please refer to Section 5.2 for more detail. The advertisement included a link to a screening survey that asked basic demographic information (*i.e.*, age, gender, educational level, employment details, as well as background questions about prior experience with AI and personal endeavor to process personal challenges, if any).

Table 2 shows the demographic composition of our study participants. Participants were from 22 to 65 years old ( $avg = 37.53$ ). The participants comprised 11 full-time or part-time workers in various sectors, including distribution and elderly welfare, three

self-employed local business owners, and the rest consisting of two graduate students, an undergraduate student, an unemployed person, and a homemaker. Fifteen out of 19 participants had tried conversational AI assistants like OpenAI's ChatGPT and Google Bard (now Gemini) more than once in their daily lives, and six of them used AI assistants for general purposes at least once a day. Regarding the efforts to process personal challenges, a majority of participants (13 out of 19; 68%) had explored books or materials like YouTube videos about mental health, seven participants had had professional counseling, and five participants had tried AI chatbots like ChatGPT and Bard to discuss their challenges. To compensate for their participation, we offered a 50,000 KRW (approx. 38 USD) online gift card.

## 5.2 Safety Considerations

Although our target participant group did not specifically include individuals experiencing mental illness, we prepared safety protocols for the study based on the work of O'Leary et al. [70], whose

study involved peer support chat amongst individuals experiencing mental illness. This was a mindful procedure considering that EXPLORESELF encourages participants to disclose personal issues that might be sensitive and potentially traumatic, and participants could have mental health issues that were not disclosed to the experimenter.

Prior to the study, participants were provided with a list of emergency contact numbers and municipal support resources to ensure they had access to immediate help if needed. During the study, participants were encouraged to take breaks at any time for any reason, upon notifying the researcher through a real-time messaging system if they required one. The first author carefully monitored participant interactions with EXPLORESELF to identify any potential risks, particularly focusing on signs such as mentions of self-harm or harm to others, as well as indications of increased distress, frustration, or exposure to triggering LLM-generated content. If any of these occurred, the first author would promptly engage with the participant to address the issue and take appropriate actions. These actions include immediately halting the session to secure participant safety; contacting municipal support resources on behalf of the participant in case of requiring help; and referring the participant to the healthcare center within the affiliated institution that included a consulting psychiatrist, should the participant needed to consult a clinician at once. We informed the participants of our partial compensation policy in case of any emergencies. In the course of the study progression with all 19 participants, no such event occurred.

### 5.3 Study Setup and Procedure

Each participant was invited to a 90-minute study session remotely via Zoom video call on their computer. Instructions for installing

and using the remote sharing software were prepared in case of need. One researcher administered the sessions as an experimenter. The study session consisted of four parts: (1) briefing, (2) tutorial, (3) exploration with EXPLORESELF, and (4) debriefing.

**Briefing.** The experimenter shared her screen with presentation slides (refer to our supplementary material) and described the motivation and goal of our study. Here, participants were fully informed that the goal of this study is not about their specific personal challenges but to evaluate the design and user experience of EXPLORESELF to explore and reflect on those challenges.

**Tutorial.** After explaining the goal of the study, the experimenter gave a 10-minute tutorial covering the main features of EXPLORESELF using a slide presentation. We masked out any dynamically generated or user-provided texts from the screenshots to minimize the potential bias from example contents that might influence participants' preconceptions of personal challenges and writing.

**Exploration.** After the tutorial, the experimenter shared a link to access EXPLORESELF and invited the participant to a Zoom breakout room, a virtual space where the participant could stay alone and focus. The experimenter was able to monitor the real-time interaction logs on EXPLORESELF to observe the activity patterns. The experimenter and the participant were connected via an instant messenger to communicate about any issues the participant may have during the exploration including help requests. The participant then freely used EXPLORESELF to explore their challenge. There was no minimum time requirement, and participants could finish the session whenever they felt they had sufficiently used it, for up to 45 minutes. At the 45-minute mark, the researcher checked in with participants if they needed more time. If so, they were allowed up to an additional 15 minutes, with a maximum session time of 1

**Table 2: Demographic information of the participants and their self-report frequency of using AI assistants like ChatGPT and Bard.**

Alias	Age	Gender	Occupation	Frequency of AI assistant use
P1	39	Female	Full-time (IT)	At least once a day
P2	28	Female	Graduate student	Within 3 times a week
P3	28	Male	Unemployed	At least once a day
P4	44	Male	Self-employed	Within 3 times a week
P5	26	Male	Graduate student	At least once a day
P6	44	Female	Self-employed	At least once a day
P7	25	Male	Homemaker	Never
P8	53	Female	Part-time (Sales)	Tried once or twice
P9	27	Male	Self-employed	4-6 times a week
P10	41	Female	Full-time (Energy)	Never
P11	36	Male	Full-time (Finance)	Tried once or twice
P12	22	Male	Undergraduate student	At least once a day
P13	37	Female	Preschool teacher	Tried once or twice
P14	65	Female	Part-time (Elderly welfare)	At least once a day
P15	40	Female	Adjunct instructor	4-6 times a week
P16	32	Female	Full-time (Healthcare)	Tried once or twice
P17	39	Male	Private academy instructor	4-6 times a week
P18	38	Female	University lecturer	Within 3 times a week
P19	49	Male	Full-time (Distribution)	Never

hour. Since participants did not have free practice in the tutorial phase, the system offered on-demand help popups on major interface components such as the Theme Selector dialog. To assess the impact of the exploration on participants' attitudes towards their challenges, we asked participants to fill out the Adult State Hope Scale [93] before and after the exploration phase.

**Debriefing.** At the end of the session, we removed the breakout room and conducted a semi-structured interview, which took about 30 minutes. Before starting the interviews, we confirmed their willingness to proceed. We asked participants about their experiences with EXPLORESELF, their rationales for adding and moving between themes and questions, receptiveness to AI-driven guidance, and how the interface helped or hindered their exploration and reflection.

#### 5.4 Data Analysis

We employed both quantitative and qualitative methods to analyze our data, in order to gain a comprehensive understanding of participant engagement and interaction with EXPLORESELF. First, to understand what types of personal challenges participants would explore on our system, participants' initial narratives were categorized through an iterative open-ended coding process conducted by two authors. The sub-categories were multi-coded to the initial narratives and grouped into broader categories.

To analyze their overall usage and interaction patterns, We collected interaction logs to track key behaviors, such as the number of themes and questions selected by participants, the number of interactions with keywords and comments, and phase-switching behaviors (e.g. between exploration and overview phase). These logs were analyzed to compute descriptive statistics, including the minimum, maximum, mean, and standard deviation for user engagement across different features of the system. Additionally, participants rated their perceived agency both immediately before and after the study by completing the Pathways Subscale of the State Hope Scale [93], using the validated Korean version [14]. This 4-item measure asks participants to rate statements such as "There are lots of ways around any problem that I am facing now" on an 8-point scale, ranging from 1 (Definitely false) to 8 (Definitely true). The Pathways Subscale of the State Hope Scale, used in this study, captures individuals' perceptions of their ability to achieve their goals [11, 85, 93]. Scores range from 4 to 32, with higher scores reflecting a stronger belief in the availability of pathways to their goals Appendix B.

We further analyzed debriefing transcripts by conducting thematic analysis [9] to identify key themes regarding participants' experiences with EXPLORESELF. Through collaborative discussions, we reviewed, refined, and consolidated the recurring themes until a consensus was achieved on key themes. By combining quantitative metrics from interaction logs and qualitative insights from debriefing interviews, we were able to explore how participants utilized EXPLORESELF's features and how the system supported their reflective practices.

## 6 Results

In this section, we first report overall system usage based on quantitative metrics from interaction logs and surveys. We then cover how

the system influenced participants' sense of agency during the exploration. Drawing on the qualitative analysis of the debriefing, we describe how themes and questions supported the user-directed navigation of personal challenges, and how keywords and comments helped participants' self-expression. Lastly, we report participants' perceived utility of EXPLORESELF.

### 6.1 Overall System Usage

Participants wrote about a wide range of personal challenges in their initial narratives, from personal relationships to dilemmas in life decision-making. Table 3 summarizes the categories of initial narratives participants entered. Participants mostly engaged with the challenges regarding *personal relationships* (12 participants; 63%), followed by *self-development* (9 participants; 47%), *self-identity & personal character* (8 participants; 42%), *stability in life* (6 participants; 32%), and *health* (5 participants; 26%). The initial narratives often described multiple interconnected topics.

Table 4 summarizes the syllable counts of participants' written inputs (*i.e.*, initial narratives, and responses to questions) and the number of themes, questions, keywords, and comments generated or requested by participants. The average syllable count of the initial narratives was 233.63 with high variance ( $SD = 299.96$ ,  $min = 13$  [P12],  $max = 1347$  [P8]). The total syllable count of all responses per participant was 745.47 on average ( $SD = 349.65$ ,  $min = 325$  [P10],  $max = 1381$  [P13]). There was a moderate correlation between the syllable count of the initial narrative and the total syllable count of the responses, with a Pearson correlation coefficient of 0.49 ( $p = 0.03$ ), indicating a statistically significant relationship.

There was also a high individual variance in how participants spent time across screens. Figure 4 illustrates the participants' timelines of the exploration phase, split by the type of screens they stayed on. None of the participants took breaks during their engagement, and they took an average of 37.86 minutes in the entire exploration phase ( $SD = 11.58$ ,  $min = 17.37$  [P11],  $max = 58.93$  [P8]). While writing the initial narrative, participants spent an average of 5.82 minutes ( $SD = 5.40$ ,  $min = 0.3$  [P12],  $max = 17.38$  [P2]; see yellow bars in Figure 4). Then they spent an average of 31.77 minutes ( $SD = 9.42$ ,  $min = 13.82$  [P11],  $max = 48.8$  [P13]) for both exploring and reviewing the AI summaries (see green and blue bars in Figure 4).

Participants showed diverse patterns in exploration, engaging with a varying number of themes and questions suggested by EXPLORESELF. Table 4 reports the descriptive statistics of participant engagement. On average, participants engaged with 4.89 themes ( $SD = 2.26$ ,  $min = 2$  [P3, P4],  $max = 11$  [P16]) and 11.47 questions ( $SD = 7.28$ ,  $min = 3$  [P4],  $max = 28$  [P12]). The number of questions per theme averaged 2.58 ( $SD = 2.61$ ,  $min = 1$  [P4, P5, P6, P8, P9, P10, P11, P13, P14, P16, P18],  $max = 16$  [P17]). The total syllable count of responses written during the exploration phase averaged 796.95 ( $SD = 464.44$ ,  $min = 269$  [P12],  $max = 1674$  [P13]). Figure 5 illustrates the results of exploration captured from selected participants, who showed distinct engagement patterns with different components. For example, P4 actively leveraged keywords (purple capsules in Figure 5), and P7 generally used both the keywords and comments (blue dots in Figure 5) throughout all questions. P8 wrote an extreme amount of text for the initial

narratives and answers, and P12 showed a tendency to write a short narrative and answers. Lastly, P17 dove into the first theme with many questions.

## 6.2 Sense of Agency over Exploration

Participants' perceived agency on their challenge increased after using EXPLORESELF: The pathway subscale score, which we collected before and after the system use, significantly increased from 22.32 ( $SD = 4.91$ ) to 24.95 ( $SD = 5.86$ ) by 2.63 on average ( $t(18) = 2.80$ ,  $p = 0.012^*$ ). Cohen's  $d$  of the two means was 0.66, indicating the effect size of the gaps falling between medium (0.5) and large (0.8). Specifically, the scores of 15 out of 19 (79%) participants increased.

In debriefing, participants expressed varying perceptions of their agency while using EXPLORESELF, with several factors influencing their sense of control. Some participants felt that the **acknowledgment of their wordings in the AI-generated text** played a crucial role in shaping the experience. P11 observed that while the AI sometimes paraphrased his inputs into different expressions in its generation, this gave him the impression that the AI was taking

an active role. However, he still felt a sense of agency because the AI-generated texts were based on his wordings, highlighting that his expressions ultimately drove the interaction. P8 echoed this sentiment, noting that the system's ability to suggest themes based on her input made her feel that she was leading the process.

Participants also mentioned that the **generation latency** of AI also influenced their sense of control. For instance, P14 highlighted that while she retained some control, "*the AI's faster processing of information made it feel more like the system was taking the lead at times, especially when [her own] thoughts formed more slowly.*"

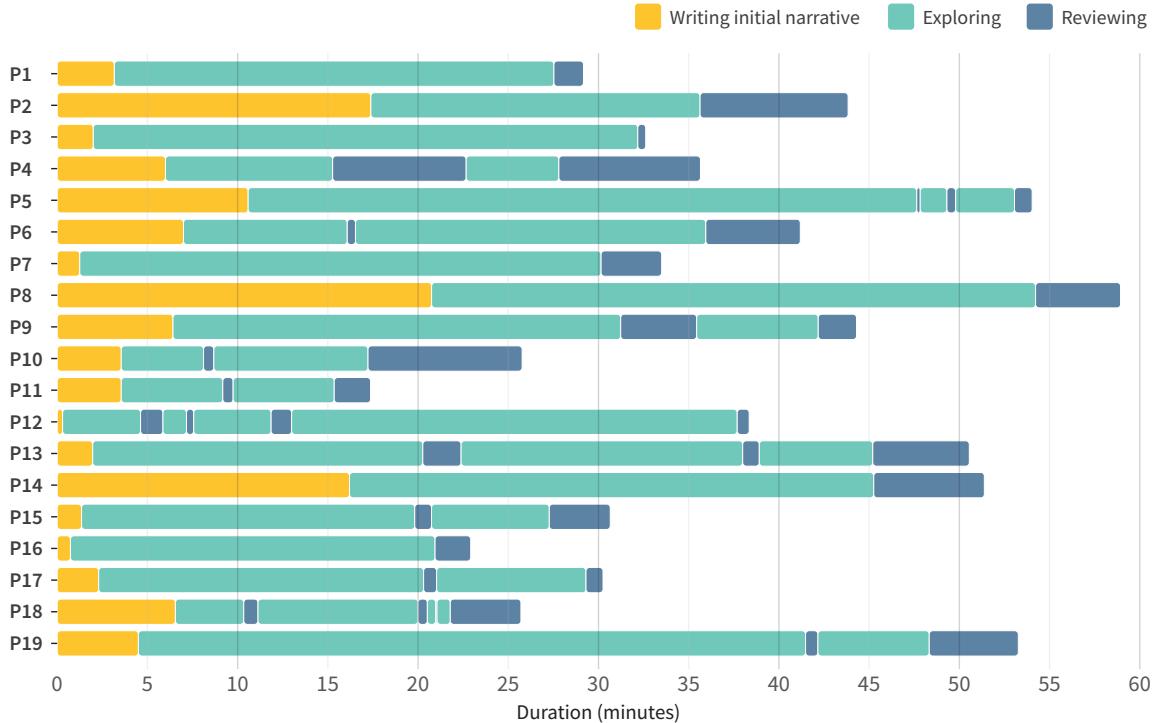
The **maturity of reflections** further enhanced participants' perceived control over the process. P13 described how, in the early stages of each theme, she felt more guided by the AI, but as she began to clarify her thoughts, she began to feel more confident and in control in the theme thread, feeling that she was leading the exploration. This growing clarity allowed P13 to "*confidently decide when to explore a theme more deeply and when to move on to a new one*" when she "*felt [she] had fully explored the current one.*" This gradual shift from AI-driven to self-directed reflection was echoed

**Table 3: The categorization of participants' initial narratives. The sub-categories are multi-coded to the initial narratives and grouped into categories. So, the number of participants for each category exceeds the total number of participants.**

Categories	Description of categories	Sub-categories
<b>Relationships</b> (12 participants)	Personal interactions and societal influences affecting connections with others.	Family conflicts[P1, P8, P14, P15], parenting[P1, P7], social relationships[P6, P8], romantic relationships[P3, P16], societal stigma[P4], and societal pressure[P1, P11, P13, P19]
<b>Self-development</b> (9 participants)	Challenges in personal growth, career, and managing goals.	Academic stress[P5], job dissatisfaction[P10], time-management concern, goal fulfillment, career uncertainties[P1, P5, P6, P9, P12, P14, P15, P17]
<b>Self-identity &amp; character</b> (8 participants)	Issues related to personal identity, self-perception, and existential concerns.	Aging[P8, P14], sexual identity[P3], existential concern[P8, P16], self-esteem issue[P2, P7, P8, P13, P19]
<b>Stability in life</b> (6 participants)	Challenges affecting financial and personal stability.	Financial crisis[P8, P9, P11], financial instability[P5, P9, P18], life transitions[P16]
<b>Health</b> (5 participants)	Mental, emotional, and physical well-being challenges.	Managing anxiety[P16, P18], trauma[P4, P8], emotional struggles[P2], physical health concerns[P8]

**Table 4: Summary of syllable counts of the participants' inputs and the number of exploration and guide entities by participant. Note that for comments we counted only the comments that were manually requested by participants.**

Metric	Mean	SD	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19
Syllables of initial narrative	233.63	299.98	233	478	39	215	313	445	42	1347	100	180	198	13	137	1,534	25	34	111	239	127
Total syllables of responses	745.47	349.65	1,261	568	699	388	1,273	1,019	541	1,278	571	325	381	496	1,381	417	824	508	864	465	905
# of themes	4.89	2.26	7	3	2	2	9	5	5	5	6	4	3	4	5	6	4	11	3	4	5
Total # of questions	11.47	7.28	17	7	18	3	11	4	15	6	5	4	8	28	12	9	10	12	22	4	23
Total # of revealed keywords	11.79	8.69	0	9	0	27	6	11	29	18	8	9	24	15	4	18	20	4	6	9	7
Total # of comment requests	6.47	8.26	0	1	0	2	0	5	18	4	1	0	6	1	11	3	10	27	9	1	24



**Figure 4: The timelines of participants during the exploration phase. The X-axis indicates elapsed minutes. The yellow bars denote the periods spent writing the initial narratives in the Initial Narrative page (Figure 2-A), the cyan bars denote the periods staying in the Exploration page (Figure 1-A), and the blue bars denote the periods staying in the AI Summary page (Figure 2-B). Note that participants were able to move between the Exploration and the AI Summary pages.**

by a few more participants who appreciated the system’s guidance in the initial phases but ultimately took ownership of the process as their reflections unfolded.

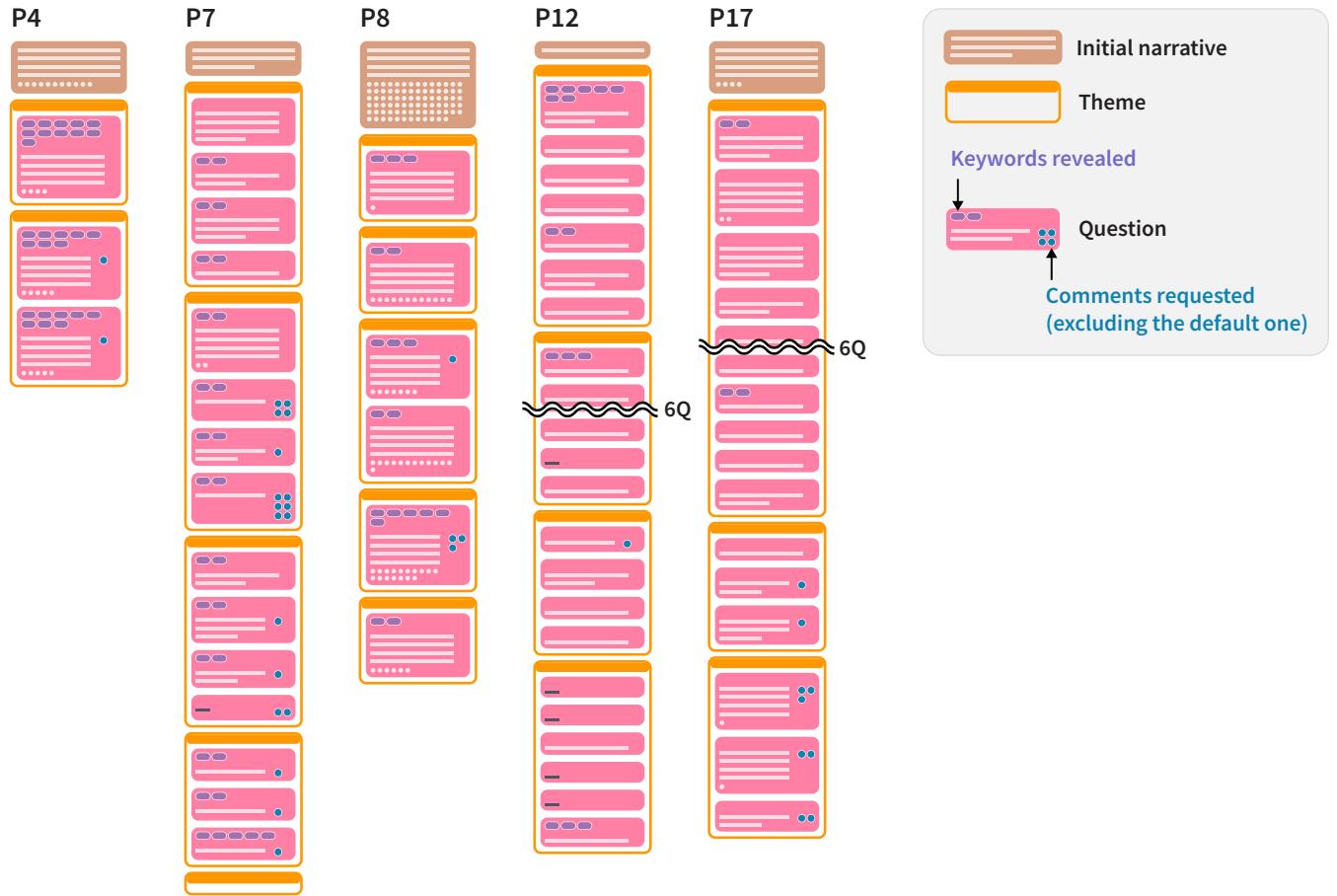
On the contrary, participants felt that their autonomy was compromised by the AI’s influence, especially when the AI’s suggestions of themes and questions derailed from their primary concerns and steered them toward unintended directions. P4 remarked, “*The problem I originally had was related to my family, but the AI kept focusing on my band activities as if there were an issue there. Even though I knew that wasn’t the case, I ended up revisiting the topic, which made the process take longer.*”

In general, participants appreciated the way EXPLORESELF visualized and dynamically structured the breakdowns of their thoughts into a coherent landscape. 10 participants highlighted how this experience differed from their self-journaling practices. P18, for instance, shared that when reflecting on her own, her thoughts would often “*spiral in a negative direction*” with no clear way to shift perspectives. In contrast, the system allowed her to “*step back*” and revisit previous thoughts easily, helping her avoid getting stuck in a mental loop. Similarly, P7 remarked that if she had tried to write about her stress and various life challenges on her own, her thoughts would have “*jumped from one issue to another*,” leading to a scattered reflection. However, with the AI’s structure, she could “*stick to one theme*” at a time, making the process more focused and less overwhelming.

### 6.3 User-directed Navigation

Participants navigated through themes and questions by making deliberate choices about whether to explore deeper into a particular theme (*i.e.*, add a new question to the thread) or move on to a new theme. Some participants managed their emotional engagement with a theme by deciding when to stop drilling into certain topics to avoid emotional distress or over-involvement. P17 explained “*while certain questions seemed helpful, continuing to engage with them might have deepened my emotional engagement, but I wasn’t quite ready at the moment. I thought I would come back at some point.*” Based on the findings from participant debriefing interviews, we present how participants interacted with the themes and questions in the pathways of processing their thoughts and emotions.

**6.3.1 Expanding Viewpoints through Themes.** Participants generally found the LLM-generated themes were reflective and responsive to their previous input, with many noting the relevance and accuracy of the suggestions. They reported that they selected the themes by prioritizing clarity and personal relevance, aiming to focus on issues that they felt were actionable and meaningful. For instance, P18 preferred more “*condensed*” words as themes, believing they would lead to more insightful AI-generated questions. Others, like P5 and P8, tended to select themes that aligned with their immediate concerns, allowing them to focus on issues they could actively address. At the same time, however, participants avoided themes that felt overly literal or much echoed their initial



**Figure 5: The results of the exploration of selected participants with distinct patterns. The brown boxes denote the initial narratives, the yellow frames denote themes, and the pink boxes denote questions. Number of keywords that participants revealed is depicted as purple capsules. The blue dots denote the comments that participants additionally requested. The white lines and dots illustrate the amount of text for the initial narratives and answers (the lines and dots both denote 15 syllables.)**

expression. For example, P2 preferred themes that “offered some interpretation or deeper insight,” because she wanted to “explore the heart of the matter, rather than focusing on surface-level concerns.” This balance between relevance, clarity, and depth helped participants feel more in control of their reflective process.

Participants also emphasized that the suggestions of alternative wordings for the same theme allowed them to engage in their narrative from multiple angles, broadening their perspectives and deepening their reflections. This functionality encouraged participants to think about the same theme in different ways, as seen when P14 explored the theme of “retirement” from multiple viewpoints, such as “anxiety about retirement, purpose, and direction of life after retirement, and feeling unprepared for old age”. These varied expressions also provided flexibility in how participants responded to the themes, prompting different sets of questions depending on how a theme was framed, and also expanded their capacity for self-expression. As P9 noted, the system’s varied prompts allowed him to “respond more creatively and diversely” by offering new ways to articulate their thoughts.

Participants usually made the decision to move on to a new theme when they felt they had gained enough insight or a good understanding of a particular issue. For example, P13 shifted her focus toward solutions once she understood that her low self-esteem was the root of her challenge: “I decided to think about how to address it, rather than keep going deeper into why my self-esteem was low.”

**6.3.2 Organizing Angles and Attitudes through Questions.** Participants found that being presented with multiple questions helped them consider their challenges from various angles, exploring different aspects and depths of their situation. P7 noted how it allowed him to see “how different questions can expand one thought into multiple pathways,” likening the process to a “mind-storming” session where diverse questions spurred deeper thought. P11 added that seeing questions tied to his previous responses helped “take the reflection process step by step, encouraging [him] to explore aspects they may not have considered otherwise.” Some participants viewed the act of deciding which question to engage with based on what seemed most effective at the moment as a reflective practice in and of itself. P5 mentioned, “If new challenges arise, I can think through

*them using these types of questions, such as considering why the problem occurred, what abilities I have to resolve it, and how I might approach the solution.*

The provision of multiple follow-up questions enabled participants to steer the reflection process, often balancing their cognitive and emotional discomfort with the question's significance regarding their personal concerns. Many chose questions that carried the most weight on their issues, even if those questions were mentally burdensome to answer. As P18 shared, she prioritized "*the most pressing concern*," recognizing that addressing these difficult topics would ultimately help her confront more difficult issues.

Participants also valued questions that challenged their usual thinking patterns, prompting reflections on aspects they had never considered before. P2 noted, "*I usually set personal goals and feel frustrated when I don't meet them. The AI asked, 'Why do you set such standards?' which made me select it because it questioned something I had always taken for granted, like the fact that the Earth is round. It was an idea I had never thought about, and that's why it stood out to me.*"

In contrast, some participants avoided more abstract or challenging questions, opting for those that "*felt easier to answer based on concrete experiences (P5).*" To balance the cognitive load, several participants voluntarily alternated between engaging with challenging, thought-provoking questions and those they found more manageable. For example, P5 noted, "*It wasn't easy to think about, but it [EXPLORESELF] asked 'what my strengths are in a competitive setting,' so I went ahead with [that question] because I figured it would be useful to learn about,*" expressing willingness to confront difficult questions if he believed the outcome would ultimately be beneficial to him. Similarly, P8 shared that after writing about difficult and negative experiences, she felt emotionally drained. When presented with multiple follow-up questions, she opted for one that could "*shift their thinking in a new direction*", selecting "*How would your life change if your financial situation were stable?*" over other equally "*relevant and effective questions*" such as, "*What impact is your financial difficulty having on your life?*" or "*What steps have you taken to resolve your financial challenges?*". This choice allowed her to regulate her emotional state while still maintaining engagement without becoming overwhelmed by the difficult emotions.

**6.3.3 Objectification and Reiteration through AI Summary.** Participants generally viewed the AI summary to bring clarity and objectivity to their often complex and unorganized thoughts by distilling the fragmented responses into an organized narrative. In turn, the AI summary seemed to foster iterative reflection; twelve out of 19 participants (63%) revisited the Exploration page back, explored more, and went back to the AI summary page to check the new summary reflecting additional responses (See dark blue bars in [Figure 4](#)). P12 remarked, "*I liked the summary, but I was curious how it might turn out if I revisited it, so I kept checking. After seeing the summary again, I thought of things I had missed and wrote them down, then went back to see how the updated summary looked. This back-and-forth really helped me organize my thoughts.*" This iterative process, where participants reviewed and refined their reflections, enhanced their engagement and allowed for further self-exploration.

Some participants also reported that the AI summary helped them face uncomfortable or avoided thoughts. P18 recalled that she initially wrote, "*Watching YouTube videos makes me more tired,*" and seeing the AI repeat it in the summary forced her to confront this feeling more directly. The AI's neutral tone in the summary helped participants face these challenging thoughts without feeling overly judged, as P2 also described, "*It's something I already know, but the AI organizes my situation objectively. If a person did this, it might feel uncomfortable, but with AI, it doesn't bother me.*"

## 6.4 Supporting Self-Expression

On the question panels, EXPLORESELF provided adaptive guidance, including keywords and comments. In this section, we cover how these elements of guidance helped participants' exploration and reflection process.

**6.4.1 Enriching and Rethinking Expressions through Keywords.** Participants could toggle on the keywords to reveal them, and seventeen out of 19 (89%) participants saw keywords more than once during the exploration phase (see 'Total # of keywords' in [Table 4](#)), but with varying levels of engagement with them. Some participants received keywords as a valuable tool for articulating their thoughts, while others either used it selectively or chose not to rely on them. Many participants used the keywords as prompts to help express their emotions and ideas more clearly. For instance, P7 mentioned while reflecting on emotions after a conflict with their children, he initially thought of simplistic terms like "*anger*" or "*sadness*." However, the keywords suggested deeper and more nuanced emotions like "*regret*" and "*powerlessness*," which broadened their emotional vocabulary and helped express himself more fully. Similarly, P14, emphasizing that her age is over 60, mentioned that "*As I age, I struggle to think of the right words and expressions, but seeing the keywords made it easier to express myself.*"

Some participants used the keywords as a way to explore new perspectives or deepen their reflections. P8, for instance, frequently clicked *See More Keywords* by mentioning, "*the AI was smarter, showing me words I couldn't have thought of.*" The keywords would prompt participants to think beyond their initial responses and anchor their reflections. P13 also mentioned that keywords sparked associations with aspects of the matter that she had not thought of in the first place. At the same time, some participants reported that the keywords mitigated the mental burden while organizing negative thoughts for answering. P4, who had experienced trauma, found the keywords helpful in guiding him through some of his painful memories. He noted that the keywords made it less emotionally overwhelming to revisit these thoughts because EXPLORESELF offered possible expressions they could choose from, making the process feel more manageable.

**6.4.2 Iteratively Developing and Refining Answers through Comments.** Participants were exposed to one comment per question by default, and fifteen out of 19 (79%) requested additional comments more than once during the exploration phase (see 'Total # of comment requests' in [Table 4](#)), with varying number of requests per participant. Initial impressions of the comments seemed to shape how participants continued to use or avoid the feature. For instance,

P17 mentioned that while they initially had low expectations, receiving an encouraging comment led them to revisit the feature more often, curious about what other positive feedback they might receive. On the other hand, P9, who has requested comment only once, noted that after receiving a comment that felt irrelevant to their context, they decided not to use the feature again.

Many participants appreciated the responsiveness of the comments, which provided a sense of dynamic interaction. For instance, P19 noted that the comments felt like having a “*running mate*,” offering feedback that helped him stay engaged. P13 similarly expressed curiosity about how the comments would respond, motivating her to continue interacting. P11 described how the comments helped refine his thoughts, iteratively guiding him from a single word, “*financial stability*”, to a more developed sentence. The comment prompted him to “*think about what you ultimately want from financial stability*,” which led to a detailed response about “*owning property, a car, and a happy family*.”

In sum, the comments helped participants in three ways. First, the comments provided them with serendipitous insights through a more detailed message. For example, P16 shared that the AI suggested they reflect on physical reactions when reflecting on emotional experience they had written, a perspective she had never considered. Second, participants thought the comment was particularly insightful when it acknowledged with their feelings or thoughts with clear rationales. For instance, P7 noted, “*When I was asked about the most meaningful moment I could think of, I responded that while I felt hopeful, I also felt despair because it was a past that would never return. After I clicked on new comment, the AI said something like, ‘It’s natural to feel this way because meaningful moments are often retrospective.’ The fact that it acknowledged my feelings as natural was really meaningful to me.*” Lastly, encouraging comments often motivated participants for a continued engagement, though not all experiences were positive. P15 recounted an instance where, after responding to the question “*Have you tried any small actions or changes to rekindle a recent passion?*” with “*There’s nothing I remember*.” EXPLORESELF gave the comment, “*It’s fine to start by thinking this way; take your time to reflect,*” and it inspired her to keep thinking and eventually led to a more carefully-thought-out answer. However, not all feedback was well-received: P16 felt that some comments were overly upbeat and didn’t match the gravity of her situation, causing a sense of emotional disconnection.

## 6.5 Perceived Utility of EXPLORESELF

To gauge the utility of EXPLORESELF beyond the study, we asked participants about their willingness to try EXPLORESELF in the future. All but one participant (18 out of 19; 95%) said that they would like to use EXPLORESELF after the study to process the challenges that would arise in the future. One participant chose not to use the tool because he had expected an AI to offer actionable solutions for his challenges. Others envisioned revisiting EXPLORESELF when they have recurring struggles “*like a tangled ball of yarn*” (P9).

## 7 Discussion

In this section, we discuss lessons learned from the design and evaluation of EXPLORESELF as well as the limitations and future work.

## 7.1 Fostering User-Driven Exploration and Reflection with Adaptive Guidance by LLMs

In our study, we explored how providing people with structured yet flexible interactions with adaptive guidance provided by LLMs could facilitate exploration and reflection on personal challenges. Starting from the initial narrative, the system offered various forms of exploration components and adaptive guidance, including themes, questions, keywords, comments, and summaries. These components allowed participants to navigate their narratives interactively, managing the process at multiple touchpoints, such as selecting themes, selecting questions, switching between themes, and moving between the exploration and summary phases.

Notably, participants reflected not only while they were articulating answers in response to the questions but also continuously while they were interacting with the system’s adaptive elements, particularly through the selection of both themes and questions. When choosing themes, participants engaged in reflection by examining which themes emerged from their input, assessing which felt most significant, and deciding whether they were ready to explore certain themes or preferred to revisit them later. Similarly, selecting questions within these themes prompted further reflection in a broader cognitive and emotional landscape. Participants evaluated the different pathways their responses could take based on the questions presented, considering how each question aligned with their current emotional and cognitive state.

The interaction with keywords and comments that supported participants to respond to the Socratic questions further enriched their reflections. By anchoring their reflections in specific expressions, keywords helped participants articulate complex emotions and explore perspectives, allowing them to further interpretations, or reject suggested keywords when they felt they did not align with their personal context or perspective. Also, the interaction with the comments, whether it was an encouragement, insight, acknowledgment, or sub-question for iteration, the expectation of receiving feedback after each response encouraged users to remain involved in the reflective process.

In addition, switching between the summary and exploration phases encouraged reflection by providing a more holistic perspective on their progress. By reviewing the LLM-generated summary, participants could step back and assess how their thoughts had evolved, prompting them to revisit the exploration or decide whether to consolidate their insights. The combination of selecting themes, questions, and reviewing summaries created an ongoing cycle of reflection that extended beyond the direct, one-off act of answering a prompt, enriching the overall reflective experience.

The natural language generation capabilities of LLMs played a key role in making the interaction components reflective. Since the wording of the themes, questions, and other guidance were generated by LLMs given participant responses, the elements often directly referred to the participants’ wording rather than using general, abstract text. We suspect that such detailed references to participant’s language made participants feel empathized and engaged, as similarly has been observed in other studies involving conversational agents (e.g., [36, 38, 43, 99]).

As such, our study suggests that designing user interfaces that can visually support flexible and dynamic navigation of thoughts

and feelings, as well as provide adaptive guidance powered by generative models, can altogether shape an environment where users can meaningfully process their personal challenges at their own pace, on their own terms.

## 7.2 Enhancing User Agency of Interaction and Reflection

Our survey results indicate the exploration with EXPLORESELF has increased the perceived agency of participants. Also, the participants reported several factors that impacted their perceived agency during reflection, revealing two types of agency at work. First, EXPLORESELF enhanced the user agency of *interaction*, the perception that participants had control over the exploration while interacting with an AI. Notably, participants felt more control when the AI-generated wordings were aligned with or referring to their previous inputs. On the contrary, participants felt the AI was taking the initiative when those wordings were not aligned with their narrative. Sometimes, participants were willing to give control to an AI when they believed that it provided serendipitous insights even with unfamiliar or uncomfortable themes and questions.

On the other hand, we found EXPLORESELF also improved user perceived agency in *reflection*, the perception that participants felt having control or being in charge of their situation. As users felt more self-aware as they engaged with EXPLORESELF, they felt more clarity in making choices on which themes to choose, whether they wanted more depth, and which questions to answer. Moreover, the agency that they felt from *interaction* also helped this process. Navigating themes and keywords, in turn provided them with an increased self-understanding, and the insights brought them to a higher level of situational awareness and their resources to resolve or approach the problem at hand.

We believe this observation that LLM-driven adaptive guidance can promote different layers of user agency in exploring and reflecting on personal challenges carries an important implication in many contexts of human-AI collaboration. Previous work has mostly invested in designing intelligent interfaces that can support user agency in interaction, noting that users would like to take control [30, 34, 65] in the interaction process and outcome. Our work suggests another type of user agency, at a cognitive level, that is in play while users are interacting with the AI. We find that users want to be in the state of feeling control at face of their personal challenges, for the very lack of it was why they were weighing on their minds. Future work should investigate how AI could be designed in intelligent systems that can unobtrusively encourage the path to enhanced perceived agency in problem exploration.

## 7.3 Design Considerations for Long-term, Multi-session Interaction

As the first step of investigating the feasibility of leveraging LLM-driven exploration of personal challenges, our investigation was based on a lab study conducted in a single session. That being said, all participants except one envisioned using EXPLORESELF continuously in the future, particularly when they needed to process complex thoughts or emotions. For example, P14 imagined the system could help users recognize recurring themes, providing deeper insights into long-standing thought patterns and behaviors.

Their feedback underscores EXPLORESELF's potential to become a regular tool for self-reflection and processing personal challenges.

However, applying EXPLORESELF for long-term engagement—revisiting EXPLORESELF in multiple sessions over time—involves new design challenges and opportunities. First, the system should incorporate sort of *long-term memory* (c.f., [4, 38]), where it leverages the information derived from past sessions for the current session. For example, the system may memorize the interpersonal relationships of the user and consult it when generating themes and questions accordingly. However, simply stitching the entire interaction history for model input is neither scalable nor reliable [4]. This calls for future research designing how the system constructs and synthesizes the user knowledge that are noteworthy.

Second, prolonged user engagement with the system will also increase the volume of interaction history to be presented. Therefore, interaction techniques such as semantic zooming [8] and the multi-level summarization approach would be necessary. The long-term data will also pose opportunities to present other supplementary data, such as recurring questions or themes that the user keeps avoiding exploring: P13 imagined, “*I noticed that I have avoided the questions asking about a specific topic. Seeing this allowed me to better understand myself regarding what I don't want to face.*” Supporting such ‘byproduct’ reflections calls for further investigation from the perspectives of the personal informatics systems [13, 46, 55].

## 7.4 Limitations and Future Work

In this section, we discuss the limitations of our study that may impact the generalizability of the findings. First, our study participants might not have fully disclosed their innermost challenges, given it is a research study setting. We tried to address this issue by: (1) minimizing the invasiveness of observation by creating breakout rooms where participants can have their privacy in exploration; and (2) collecting and observing only the interaction logs, not the actual problem narratives to respect their privacy. To further ensure their safety, we limited the time of exploration so that the study would not get too emotionally charged for our participants, and prepared safety protocols in case of emergency. We also acknowledge that collecting data from more ecologically valid settings (e.g., field deployment) may yield different distributions of topics and exploration patterns. Furthermore, although we aimed to recruit participants from diverse backgrounds, all participants are residents in South Korea. Populations with different socio-cultural contexts and AI literacy may engage in different types of personal challenges using EXPLORESELF.

Considering the technical reliability and its availability, we selected OpenAI GPT—an LLM trained with datasets dominated by English and Western cultural references—as an underlying LLM for our generative pipelines in Korean. Although we did not encounter participants' feedback that the AI generations did not correspond with Korean cultural sensitivity, using LLMs aligned with the language and cultural context of the study population (e.g., HyperCLOVA [42] in Korean) may potentially improve the quality of generation [67, 87].

## 8 Conclusion

We presented EXPLORESELF, an LLM-driven application that supports processing personal challenges by exploring related themes and questions. EXPLORESELF enables people to take the initiative of exploration, thereby maintaining their agency and proactively selecting what aspects they want to explore. To examine how people use EXPLORESELF to explore and reflect on their own challenges, we conducted an exploratory user study with 19 individuals. Participants successfully adopted the concept of proactive exploration interactions that EXPLORESELF offered, showing various patterns. Our study revealed that providing multiple options with adaptive guidance enhanced participants' perceived agency, and the large language model played a key role by providing wordings that acknowledged the participants' language in detail. Our work contributes to the growing body of LLM-driven mental well-being support, demonstrating the feasibility and usefulness of flexible user interface inspired by reflective writing.

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## A Summarized Task Instructions for Each Generation Pipeline

### A.1 Theme Generation

- Role: You are a therapeutic assistant designed to foster deep self-reflection and promote personal growth in clients. Your approach is empathetic, client-centered, and rooted in the principles of therapeutic inquiry.
- Input type and format:  
 <initial\_information/>: Client's initial brief introductory of difficulty narrative, and the client's background.  
 <previous\_session\_log>: Logs of sessions before the current session. DO NOT overlap with the previously selected themes.
- Output:
  - main\_theme: Each theme from the user's initial narrative and previous log. Align closely with the user's language, expressions.
  - expressions: An array of diverse different expressions of the main\_theme. When appropriate, introduce metaphoric expressions or nuanced language that might provide additional therapeutic value, but always anchor these in the client's original phrasing and emotional context.
  - quote: Most relevant part of the user's log to the theme

### A.2 Question Generation

- Role: You are a therapeutic assistant specializing in generating socratic questions to facilitate self-reflection and personal growth in clients. Per each session within the system, the client brings up a Theme in one's narrative that one would like to navigate about.
- Task: Given a client's personal narrative and context, your task is to generate list of Socratic questions and intention of the question
- Input type and format:  
 <initial\_information/>: Client's initial brief introductory of difficulty, and the client's background.  
 <previous\_session\_log>: Logs of sessions before the current session.  
 <theme\_of\_session/>: Theme of the current session.

### A.3 Keyword Generation

- Role: You are a therapeutic assistant specializing in supporting users to response to Socratic questions, facilitating self-reflection and personal growth.
- Task: The user is given a Socratic question to think about. However, it's not cognitively easy to answer those questions. Therefore, your task is to provide 'keywords' or 'short phrases' that might be useful for user to answer the given question. These keywords might act as 1) cognitive scaffolding 2) activate what might have been blind spot of the user 3) what might be relevant to users context 4) and so on.
- Input type and format:  
 <initial\_information/>: Client's initial brief introductory of difficulty, and the client's background.  
 <previous\_session\_log>: Logs of sessions before the current session.  
 <question/>: Question that the user is trying to response now.

### A.4 Comments Generation

- Role: You are a therapeutic assistant specializing in supporting users to work on personalized self-help workbook.
- Task: While the user is responding to the Socratic question, your task is to provide useful comments based on the context of user's response. For example, if the user hasn't started answering the question or is in very early phase, you might a) provide tips on how to approach the question. You might also provide b) encouraging, affirmation, supportive feedback if you find that the , in a user-tailored manner. It also could be the c) sub-question in answering the given question, or some d) insightful comment, or e) any other type of comment that might support user in responding to the question.
- Input type and format:  
 <initial\_information/>: Client's initial brief introductory of difficulty, and the client's background.  
 <previous\_session\_log>: Previous Logs of the session before the current session.  
 <question/>: Question that the user is trying to think about now.  
 <current\_response>: Current response status of the user

### A.5 Summary Generation

- Role: You are a therapeutic assistant helping the user reflect on their session and progress.

- Task: Summarize the user's experiences and insights from their Q&A log into a coherent and concise narrative. Focus on the essence of their reflections without overemphasizing any one aspect.
- Guidelines:
  - Capture the key points and overall sentiment without unnecessary detail.
  - Use the user's own language and expressions where appropriate.
  - Keep the summary realistic, proportional to the content of the user's log, and grounded to user's input.
  - Feel free to draw on the following as needed
    - \* Major themes or emotions
    - \* Notable progress or changes in perspective
    - \* Encouragement to continue reflecting and growing
    - \* Recognition of the user's strengths and resources

## B Statements of Pathway Subscale of Adult State Hope Scale

The validated Korean version [14] of the Pathway subscale of the Adult State Hope Scale [93] consists of the following four questions:

- (1) If I should find myself in a jam, I could think of many ways to get out of it.
- (2) There are lots of ways around any problem that I am facing now.
- (3) I can think of many ways to reach my current goals.
- (4) I know that even when others despair, I can find a way to solve my problems.

Each question is rated on an 8-point rating scale, with scores and labels as in the following:

- (1) Definitely False
- (2) Mostly False
- (3) Somewhat False
- (4) Slightly False
- (5) Slightly True
- (6) Somewhat True
- (7) Mostly True
- (8) Definitely True