

Nabokov's Cards: An LLM-Assisted Co-Writing System to Support Bottom-Up Creative Writing

DASHIEL CARRERA, University of Toronto, Canada

ZIXIN ZHAO, University of Toronto, Canada

ASHISH THOMAS, University of Toronto, Canada

DANIEL WIGDOR, University of Toronto, Canada



Fig. 1. The Nabokov's Cards system, where there are (a) card options to i) edit the text on cards, ii) combine cards together using an LLM, iii) decouple cards that were combined back into their original constituents, iv) regenerate LLM-generated text that resulted from a combination, and v) delete a card. UI elements to (b) favorite cards, (c) stash cards, (d) add new cards, and (e) access past usage history via undo/redo are also provided. Operations that use GPT-4o LLM generated text are tagged with a small green “GPT-4o” tag.

We introduce Nabokov's Cards, a creativity support tool that uses Large Language Models (LLMs) to support prewriting. Inspired by the writing process of Vladimir Nabokov, Nabokov's Cards enables prewriting ideation by providing users with an interface to write idea fragments on notecards and combine them into new sentences or concepts using an LLM. We evaluated Nabokov's Cards through a one-week user study with professional creative writers ($n=13$) to explore writers' prewriting processes and learn about their usage of the system. Through our interviews, we found that writers characterized prewriting as a long, amorphous process that involved observations of the real world and accumulation of idea fragments. Writers in our study found that Nabokov's Cards facilitated prewriting through nonlinear interactions, divergent thinking, play, improvisation, and reflection. It also encouraged innovative approaches among writers that surpassed the clichés and redundancy often found within AI generated text today. We note how future AI co-writing systems may benefit from designs that facilitate prompt engineering and modular thinking.

Authors' addresses: Dashiell Carrera, dcarrera@dgp.toronto.edu, University of Toronto, Toronto, Ontario, Canada; Zixin Zhao, zzxiao1@cs.toronto.edu, University of Toronto, Toronto, Ontario, Canada; Ashish Thomas, ashish.ajinthomas@mail.utoronto.ca, University of Toronto, Toronto, Ontario, Canada; Daniel Wigdor, daniel@dgp.toronto.edu, University of Toronto, Toronto, Ontario, Canada.

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1 INTRODUCTION

In a famous early 20th century exchange, painter Edgar Degas bemoaned to poet Stéphane Mallarmé that though he had many ideas for great poems, he had trouble writing them. In response, Mallarmé replied, “*My dear, Degas! Poems are not written with ideas, but with words.*” [53].

There is a common belief that writers have a firm idea of what they will write before they begin writing. However, many renowned literary authors like George Saunders, Donald Barthleme, Mark Haber, and Vladimir Nabokov all begin their writing process without a clear idea for a story [1, 4, 28, 57]. Instead, their ideas for stories emerge in a “bottom-up” fashion during the writing process. Many popular AI co-writing tools for creative writing, like Sudowrite, Writesonic, and ChatGPT, all contain features which help writers convert story ideas into text. However, they contain far fewer features which help convert text into ideas in a bottom-up fashion. In this paper, we explore how LLM-assisted writing tools can better support emergent and bottom-up creativity in the creative writing process.

We focus on the part of the creative writing process known as “prewriting.” Prewriting is any creative activity for a work of writing that occurs before the author starts their first draft [45]. Prewriting is an often nonlinear process in which small pieces of ideas may be generated in a random order but are generally pieced together into a coherent form at a later date [38]. Prewriting can involve tasks like journal writing, reading other books, conducting research, or oral recitation [3]. While there have been some recent tools which support exploratory search with LLMs [47, 65] and some that explored prewriting in HCI [38, 72], little work has explored how LLMs can support prewriting.

To address this gap, we developed **Nabokov’s Cards**. A demo of our application is available online ¹. Nabokov’s Cards present a novel interaction metaphor for LLM-assisted cowriting in which notecards drag-and-drop to merge and combine ideas. We draw inspiration from Vladimir Nabokov, who prewrote his novels by writing ideas, sentence fragments and images onto notecards that he would rearrange until narrative patterns emerged [51, 69]. He would then translate these notecards into full novels ². Our system allows writers to write fragments of text onto notecards and merge them into larger pieces with the aid of an LLM. In doing so, Nabokov’s Cards enables an LLM to help ideas emerge from writing rather than helping text emerge from ideas.

We asked 13 professional creative writers about their prewriting practices in a short interview and then gave them a week to use Nabokov’s Cards and record their reflections. We discussed their reflections during an hour long exit interview and asked them to complete a brief usability survey. Interviews about writers’ processes show that prewriting is a long, amorphous process in which writers observe the world, gather inspirational materials, and write down fragments of ideas. Our study demonstrates that this interaction metaphor spurred a variety of approaches to prewriting, fostered a spirit of play, caused writers to re-imagine their own writing, and enabled them to reframe the limitations of

¹<https://creative-c9e7df5a5b26.herokuapp.com/board>

²His posthumously published last novel, *The Original of Laura*, was published as a series of these unfinished notecards

LLMs as creative constraints. Nabokov’s Cards contributes a novel human-AI dynamic that could encourage innovation and reflection not only with prewriting, but also at any stage of the writing process.

2 RELATED WORK

As tools to support creative writing sit at the intersection of creativity and writing support tools, we first describe related literature surrounding the creative process of creative writing. We then describe previous prewriting focused papers within the HCI community before discussing the recent advancement in LLM-assisted writing support tools.

2.1 Emergence and Non-Linearity in Creative Writing

Much of the existing work on creativity support tools has used linear models like Wallas’s four-step model of creativity [23, 71]. This linear model does not always align with how professional creatives in arts and design view the creative process, which they describe as developing ideas from ambiguity [58, 59, 78]. Sawyer characterized this improvisational nature as a zig-zagging path, where ideas emerge unpredictably and iteratively [58]. Creative writing is inherently iterative, spontaneous, and non-linear [12, 21, 31, 56]. Writers often start without a clear idea, aligning with Nabokov’s notion that “the pattern of the thing precedes the thing” [42]. Additionally, although the concept of emergence has been explored in design, information discovery, and play [17, 33, 62, 68], little research has focused on aligning tools with this understanding or accommodating ambiguity effectively [58, 62]. Our research aims to develop an application that supports emergence during writing, facilitating iterative exploration of ideas without a set goal.

Some writers foster emergence by using surrealist practices like automatic writing [8, 22], or use techniques by the French poets, Oulipo, who imposed constraints on their writing, such as avoiding the letter “e” or using the N+7 method [46, 70]. Different writers have different approaches, with some preferring to gather all ingredients before starting, while others tinkering as they go [12, 44]. Despite these differences, however, this type of bottom-up creativity involving collecting fragmented pieces of inspiration and rearranging them can foster originality and spark emergence [60]. In Nabokov’s Cards, we use a bottom-up approach to support writers in exploring and experimenting with their ideas.

2.2 LLM-assisted Creative Writing

The vast number of writing support tools that exist has led to the development of several design spaces [24, 36], taxonomies [73], and surveys [64, 77]. Recent work on creative writing with LLMs, for example, has focused on how they are used for slogan generation [16], screenplay writing [41], and narrative writing. How the AI manifests can differ; for instance, some have implemented turn-taking strategies to enable AI to be a co-creator [20, 43, 61, 67, 75] or have viewed AI as an assistant that only provides suggestions [16, 50]. Prior work has shown that experienced writers typically have distinct writing styles and methodologies that are ill-suited for existing LLM-based text generation systems [10, 29]. Other works, however, showed that writers believed in the potential of LLMs for brainstorming, story detail generation, world-building, and research assistance [29].

Outside of literature, many of the popular commercial LLM-assisted creative writing tools (e.g. SudoWrite³, novelcrafter⁴, NovelAI⁵, Squibbler⁶) facilitate linear writing workflows. In these applications if a user wants to piece together, sort through, or combine portions of a generated text, they have to scroll linearly, search, and copy and paste. This

³<https://sudowrite.com/>

⁴<https://www.novelcrafter.com/>

⁵<https://novelai.net/>

⁶<https://www.squibbler.io/>

has been demonstrated to be difficult for users and does not align with the non-linear processes of many creative writing workflows [40, 66]. Therefore, with our work, we explore how we can accommodate non-linear writing flow and ideation using LLMs so that our system satisfies this user need.

2.3 Writing Support Tools for Prewriting

Prewriting is not definitively defined in HCI, with works like Zhao et al. [77] defining it with respect to Wallas's creative process model [71], while other works like Wan et al. [72] and Lu et al. [38] define it as analogous to the planning stages of writing. Works focused on supporting prewriting typically involve activities like brainstorming, outlining, and organizing, which are critical for professional writers who need tools that inspire creativity. Although building tools to support prewriting is not novel, much of the existing tools in HCI are designed to support multimedia storytelling and education (e.g. [35, 52, 55]) rather than creative writing. Prior works on prewriting tools introduce ways to visually organize writing plans [9, 38] and aid ideation [14, 15, 19, 25, 41, 72]. Works like Inkplanner [38] and Yarn [9] proposed systems that used visualizations to facilitate non-linear workflows during prewriting. Beyond these works, however, research on non-linear writing workflows is limited.

Other systems focus on sparking new ideas, with some proposing the use of photos or social media posts [14, 19, 35, 54], and others use text [25]. Recent works have also incorporated LLMs for ideation, for example, Talebrush [15] uses multimodal inputs to generate stories using LLMs guided by sketched plot arcs. Although, prior work [72] shows that LLMs are able to support both divergent and convergent ideation during prewriting, studies evaluating LLM-based systems with professional writers, like Dramatron [41], are scarce and long-term evaluations even more so. Overall, while prior works on writing support tools have examined various ways to support prewriting, little work has explored how these tools fit within the creative writer's workflow. Through our work, we aim to better understand the prewriting process and introduce a bottom-up human-AI dynamic. We verify our approach by evaluating our system, Nabokov's Cards, in a week-long evaluation with professional writers.

3 DESIGN OF NABOKOV'S CARDS

Nabokov's Cards was developed using Python's Flask framework. The front-end interface was built using Javascript and p5.js. The system was deployed as a web application using Heroku⁷ to remove the need for installation and enable accessibility across different devices. Flask facilitates interactions between the front-end and the backend. When users interact with cards in the front-end interface, the content of the card is sent to the backend for processing. The backend handles API requests to OpenAI's GPT-4o through prompt engineering. We use prompts to generate combinations of cards that are adjusted based on the type of text on each card (i.e., word, phrase, sentence, or paragraph). We developed a simple algorithm based on the number of spaces to detect the type of text on each card. The complete set of prompts used to combine cards can be found in Appendix C.

3.1 Iterative Design Process

A brief iterative design process was used to develop Nabokov's Cards and improve its core mechanics and interaction paradigms. We present the details of the procedures and results of these pilot studies in Appendix B. We first created a prototype of Nabokov's Cards and conducted a pilot study (N=3) to evaluate its features and potential. We identified the main limitation as the usable interface space, leading to the implementation of a stashing feature. Next, we gathered

⁷<https://www.heroku.com/>

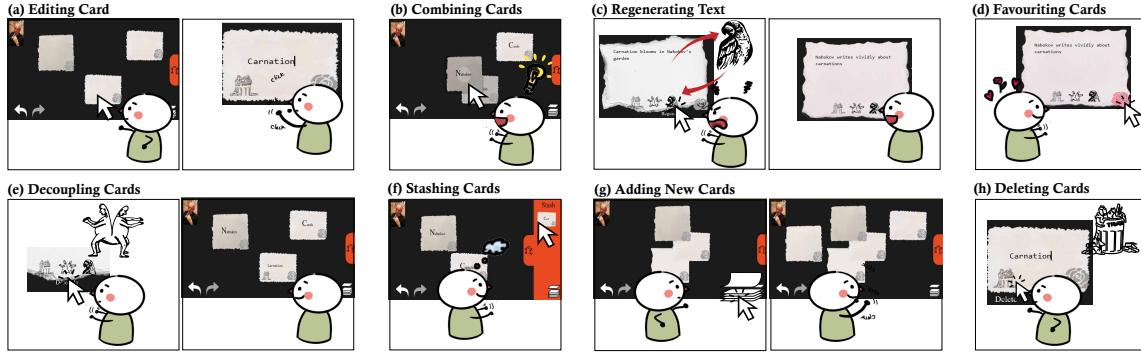


Fig. 2. Example walkthrough of different functionalities within Nabokov's Cards. These include (a) editing cards by double clicking, (b) combining cards by drag-and-drop, (c) regenerating combinations using the parrot icon, (d) favouriting cards by clicking the rose, (e) decoupling cards by clicking the splitting human icon, (f) stashing cards by dragging the card over, (g) adding new cards by clicking the stacked page icon, and (h) deleting cards by clicking the trash icon.

feedback from undergraduate students ($N=19$) in a Generative AI and the Arts course. These students, experienced with generative AI tools, provided valuable insights on interface bugs, response length, and text fragment combination. Our first pilot study found that preloaded cards discouraged the composition of original fragments and limited idea generation to the preset vocabulary. Unwritten cards help users develop their own ideas, aligning with our goal to support bottom-up creativity. Therefore, we changed the system to show an unfilled card on first load. They also found that the prompts we used generated text that was too verbose. To address this, we revised the prompts. Initially, we planned to run this study on tablets to mirror the tactile experience of Nabokov's method. We conducted a week-long pilot study with HCI researchers ($N=4$). Our pilot participants found that the tablet interaction did not add to the experience, and participants found it difficult to input text on the touchscreen. As a result of this study, we decided to conduct the final study on computers. Results from these iterative rounds of pilot studies were used to help redesign Nabokov's Cards. We describe the UI elements of our system in the next section using a walkthrough.

3.2 System Walkthrough

The individual components of the system, along with their descriptions, can be seen in Table 1. To explain the functionalities of Nabokov's Cards, we describe a sample workflow with the system, in Figure 2. All UI elements are summarized in Figure 1. Upon opening the web application, the user is taken to a main board area with preloaded empty cards. The user can double-click on a card to enter **edit mode** (Figure 2a), where the font changes to monospace. To exit edit mode, the user can click anywhere on the board. Allowing direct manipulation of all the text allows users to have more direct control over both their own text and generated text. Then, users can **combine cards** (Figure 2b) using an LLM by clicking and dragging one card on top of another, supporting reassembling fragments to spark new ideas. If the user does not like the text generated, cards can be quickly **regenerated** (Figure 2c) by clicking the parrot icon, inspired by Bender et al. [5]'s paper on LLMs as stochastic parrots. Quick regeneration encourages improvisation and reduces the perceived permanence of merging. Once the user settles on a string of text, this card can be **favourited** (Figure 2d) by clicking the rose icon, making its content examples in future prompts to guide text generation. This feature allows users to influence and guide the LLM output. Combined cards can be **decoupled** (Figure 2e) by clicking the split icon. Cards can also be **deleted** (Figure 2h), and actions can be **redone/undone** (Table 1) to recover previous

Table 1. All the system components and their functionality

Feature	Description
 Edit	User can double click any card to edit texts on the cards.
 Combine	Users can drag any card on top of another to generate new text combinations.
 Decouple	Users can undo any combination and obtain the original individual cards.
 Regenerate	Users can regenerate texts written on cards.
 Delete	Users can delete any card.
 Favourite	Users can let the tool know the type of texts they like.
 Stash	Users can put cards away to clear the screen.
 Add	Users can add new cards.
 Redo/Undo	Users can redo/undo any action.
 Help	Users can access a tutorial for help.

cards or versions. The history feature was implemented to support experimentation and iteration. Users can **add new cards** (Figure 2g) by double-clicking on an empty board area or clicking the paper stack icon in the bottom right. Making the process of adding cards easy is important to support ideation and experimentation. Finally, a **stash** (Figure 2f) area allows users to move cards away from the main board by clicking the suitcase icon and dragging the card into it.

4 STUDY WITH PROFESSIONAL WRITERS

The aim of this study was to understand the prewriting process of professional creative writers and how Nabokov’s Cards was able to foster bottom-up and emergent creativity in this process. In this section, we ask writers about their prewriting practice and how they used Nabokov’s Cards. We note how the system altered participants’ creative relationships with the LLM. We also detail how writers used different features of the system and how these features informed their creative process.

4.1 Participants

Participants were recruited using a combination of snowball sampling and direct email to writers who were within the professional network of the first author, who is a published novelist. Recruitment was primarily concentrated within the literary community of Toronto, where the sponsoring university is located. All participants were professional creative writers, which we define as creative writers who had published at least one book. Participants were paid \$250 CAD for their participation in the study. The participants worked in a diverse range of literary disciplines, including poetry, fiction, and songwriting. Initially 16 participants were recruited to participate in the study; however, three participants (P2, P6, P15) withdrew from the study due to other commitments. As a result, the final sample consisted of 13 participants (Table 2).

Table 2. Demographic information of participants that completed the study.

PID	Age	Gender	AI Writing Experience	Education	Years Writing	Genre	# Books Published	Venues In Which Published
1	25-34	Male	Yes	Master's	20	Experimental, Poetry, Non-fiction, Fiction, Poetry	2	The Flaherty Seminar, C Magazine, Canadian Art
3	35-44	Female	No	Master's	10	Fiction, Non-fiction, Poetry	3	The Walrus, Brick, Joyland, Prism Int.
4	65+	Male	No	Bachelor's	50	Fiction, Non-fiction, Poetry	8	Pedlar Press, Coach House Press, The Quarterly
6	25-34	Male	Yes	Bachelor's	20	Non-fiction, Poetry	2	CV2, Arc, Malahat Review, Brick Books
7	45-54	Male	No	Master's	21	Fiction, Poetry, Theatre	2	Publishing houses, Theatres, Record labels
8	25-34	Female	Yes	Master's	10	Fiction	1	Literary Magazines, Anchor/Doubleday
9	25-34	Female	Yes	Master's	10	Fiction, Non-fiction, Poetry	1	Capilano Review, Ex-Puritan
10	35-44	Male	No	Professional	36	Fiction, Non-fiction, Poetry	3	Comic publishing, Magazines, Editorial, Podcasting
11	35-44	Female	No	Bachelor's	14	Fiction, Non-fiction	1	Minola Review, Smoke-Long, Lit Hub, Globe & Mail
12	35-44	Male	Yes	Bachelor's	30	Fiction, Non-fiction, Poetry	1	Arc Poetry, Descant, BBC News, The Globe
13	35-44	Male	Yes	Bachelor's	15	Fiction, Non-fiction	3	Maclean's, Toronto Star, Globe & Mail
14	35-44	Female	No	Master's	20	Fiction, Non-fiction, Poetry	2	Lit Hub, Globe & Mail, The Walrus, Hazlitt
16	45-54	Female	No	Master's	28	Fiction, Non-fiction	4	Hazlitt, Times, Globe, CBC

4.2 Procedure

The study began with a prewriting interview and tutorial session conducted via Zoom. The prewriting interview lasted about 45 minutes and explored the creative activities that occurred before each writer began their first draft (e.g., brainstorming, material gathering, and other preparatory processes). Following, we held a tutorial where participants were introduced to Nabokov's Cards through a guided walkthrough on their own devices while screen sharing.

After the study, participants took part in an exit interview conducted via Zoom. They were first asked to complete a survey to assess their engagement with the system. The survey included Likert scale questions measuring the frequency and intensity of use, the features participants engaged with most frequently, and their overall experience using the system. Additionally, the survey explored how participants conceptualized their relationship with the AI, how much they felt it influenced their creative process, and how often they generated novel ideas while using the platform. While participants completed the survey, the research team reviewed their diary logs to identify key patterns in their recorded experiences. Participants then participated in a semi-structured interview that lasted approximately one hour. The interview asked a set of preset and new questions based on key patterns identified in diary logs to explore how participants integrated the system into their writing practice and their perceptions of its potential utility in the long term.

4.3 Data Analysis

The data collected from the exit interviews and diary logs were then thematically analyzed by two members of the research team. Each researcher independently coded the interviews and diary entries, identifying recurring themes and patterns. Following the initial coding process, the two researchers compared their findings, discussing and refining the themes to ensure alignment and consistency. In what follows, we first detail the results from the prewriting interview, detail results from the exit survey, and then explore the final set of themes that were identified from the exit interview and diary log data.

4.4 Prewriting Interview Results

In this section, we detail the results of the prewriting interview conducted at the beginning of the study. Our results demonstrate that professional creative writers see prewriting as an amorphous process in which observation, collecting material, and reflection are key.

4.4.1 Writers are passive in their prewriting process. Writers' prewriting process was not described as conscious or active, but rather a mindset which reaches for ideas, observes closely, and reflects on what's noticed. Similar to other creative writing literature [21, 56], one way participants generate material and actively search for ideas is by "*freewriting*", the practice of writing continuously without editing (P7, P12, P13). Four participants (P3, P5, P14, P16) mentioned going on walks to "*see new things and open creative side of [their] brain*" (P14) or using walking to "*write in [their] head*" (P16). Some writers listened to music (P7, P10) or created playlists (P10), watched movies (P7, P9), or read comics (P10) or other books (7/13). Some participants would "*read prose that's really good before [they] start*" (P8) or read "*texts that [they] find inspiring or energizing before [they] go into [their] writing time*" (P14), while others would read books to let the author's style "*contaminate [their] own work*" (P16) and use them to "*guide [them] through the project*" (P13). In contrast, some participants preferred to consume content from different genres or mediums to avoid direct influence, for example, "*read[ing] poetry if writing fiction*" or "*watch[ing] a movie if making music*" (P7).

Participants collected their observations for later reflection by using a "*notebook*" (7/13), "*notes app*" (9/13), or "*Google Docs*" (4/13). While some wrote "*nouns on coloured cards*" (P4) or printed out pages to "*physically move around*" (P3, P5), others preferred to "*craft things in [their head]*" and "*put it on the page as complete as possible*" (P1). Four of the participants who wrote poetry (P3, P4, P9, P12) used collected fragments directly as lines in their poems. This sequence of collecting, recording, and reflecting suggests a "bottom-up" process in which the writers are collecting components for a literary work without knowing how all the components will fit together at the end.

4.4.2 Prewriting has a long time scale. Writers are typically patient with their process, waiting for ideas to percolate and emerge over time. Participants reported that prewriting was not isolated to the time before a given project or goal. They often thought of ideas at different stages of their life, with some seasons or times providing more energy and opportunity for their creative process. They often let ideas "*percolate a bit*," but they didn't "*really actively think about it*" (P11). Rather than feeling like they encountered "*writer's block*", more experienced writers see this as part of their creative process and let themselves "*disengage from writing... sort of just step away from it and do something else*" (P16). Writers also acknowledge that collected fragments might not develop into anything, stating how "*95% of the work gets tossed*" (P7). Some writers will use their own memory as a way to identify the ideas that resonate with them the most. For example, many writers mentioned that good ideas are something that they "*remember*" (P5), "*[have] resonance*

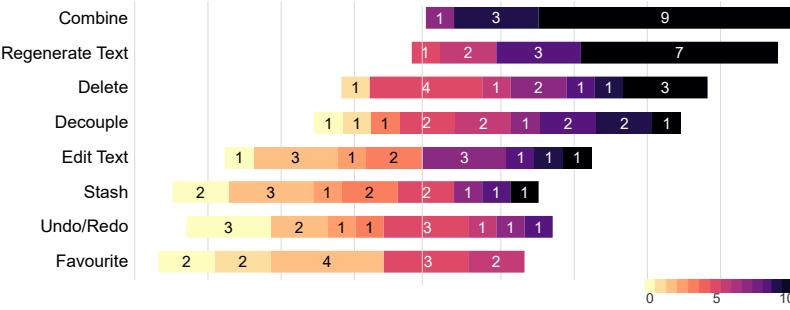


Fig. 3. Bar graphs showing participant's responses to self rating how frequently they used features of Nabokov's Cards during the study period on a scale of 0 (not used at all) to 10 (frequently used).

with (P9), or “*still think about*” (P13) after some time. Therefore, prewriting tools may benefit from being easier to incorporate in daily writing practices rather than providing one-off support.

4.4.3 Prewriting not as a discrete process but as a mode. Participants felt that there were a lack of cognitive boundaries between prewriting and writing. Over half of the participants explained how they did not distinguish between writing and prewriting since they saw their work in a more holistic manner. For instance, P3 mentioned how they created “*two or three different poems*” before realizing that those poems were actually prewriting for a new poem. Many echoed how the entire writing process was not a “*top to bottom*” (P4) or linear process. For some writers, prewriting occurs during the revision of existing work. Overall, writers often felt that the prewriting process could only be identified after finishing their work. This suggests that prewriting tools should consider the writing process holistically and work well with any stage of the writing process so that when a writer find themselves in a prewriting “mode”, they can reach for a tool that suits their needs.

4.5 Nabokov's Cards System Evaluation Results

In general, participants were positive about Nabokov's Cards, finding some of the generated text “*humorous*” (P8) and seeing the potential of using LLMs as a way to “*experiment with language*” (P4). We share some sample texts created by participants from our study in Figure 4. When asked to rate their feature usage frequently, participants most frequently used combine and regenerate cards, followed by delete and decouple cards, as shown in Figure 3. In this section, we present the themes that emerged from the exit interviews.

4.5.1 Encouraged a variety of approaches. Writers took various approaches to using Nabokov's Cards and, in keeping with the findings of the prewriting interviews, interpreted “prewriting” to encompass a variety of tasks for ideation using bottom-up creativity. Even over the course of the study, individual writers were not uniform in their approach to the system. P13 described taking a different approach with the system daily but running out of approaches on Day 5. Meanwhile, P10 believed that they had not hit their stride with the system until Day 6.

Writers' goals for outputs from Nabokov's Cards varied widely as well. Some writers, like P5, tried to generate multiple scenes for the same story, as seen in Figure 5. Whereas P16 was more interested in shorter fragments and using favourites to mark their preferences, shown in Figure 5. Similarly, another participant was interested largely in what connections the system could make between words and what “*connections that they weren't seeing*” (P11).

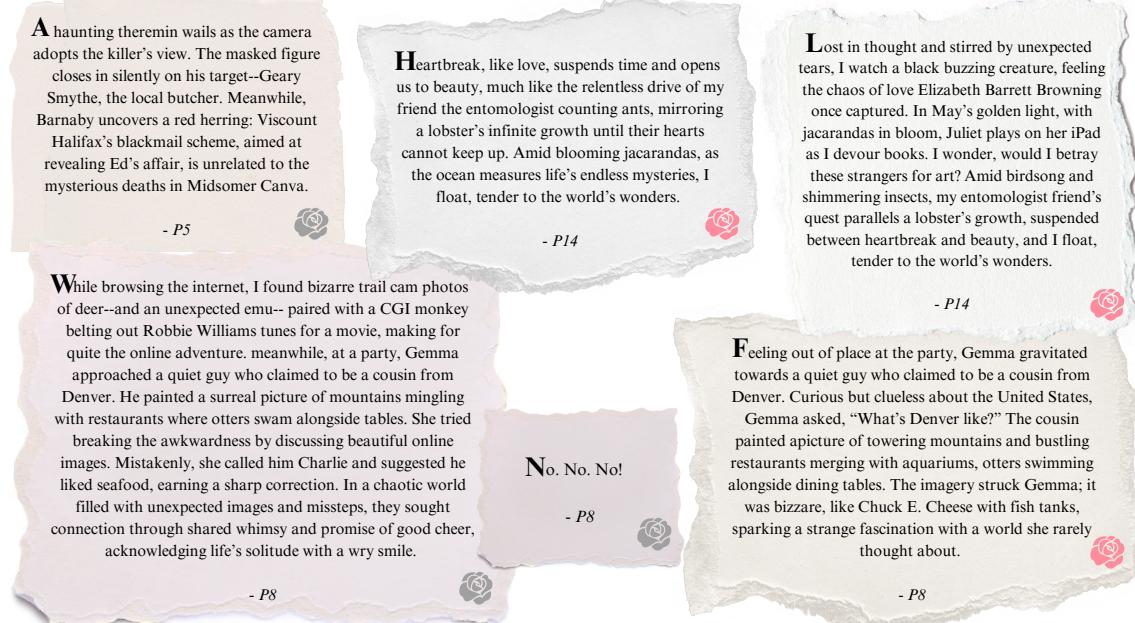


Fig. 4. Examples of cards created by participants in our study.



Fig. 5. Screenshots of two different workflows while using Nabokov's Cards, (right) P5 focuses on organizing ideas in a grid format while (left) P16 has more fragmented cards favoured to show preference.

Also, P3 became interested in how Nabokov's Cards might reassemble sentences she had already written for her novel-in-progress, breaking text fragments into clauses to be recombined by the system.

Writers also varied in what input they put into Nabokov's Cards. Some, like P10 and P14, had an existing corpus of notes that they had inserted into the system. P14 inserted all the notes from their notes app while another participant noted that they have “tons of little lyric couplets around that just never form a song” and felt that “this seemed like a good opportunity to throw some stuff onto the cards” (P10). Other writers tried inputting elements from other sources, for instance, “I made observations on things in the room then added thoughts and feelings” (P8). Others tried creating cards



Fig. 6. Likert scale results reporting participants' rating of questions related to the usability of the system.

that were more like prompts and applying them to multiple different cards. P4 “tried to get a good conversation going by prompting ‘Then he said’ in a note, and doing that repeatedly.”

4.5.2 Fostered creativity through improvisation and play. We found that Nabokov’s Cards encouraged participants to be curious, explore, experiment, and improvise by introducing play elements. From the Likert responses, Figure 6, almost all participants (11/13) could generate ideas with the system and incorporated phrases from Nabokov’s Cards into works they created over the week. We also saw that all the participants felt that they were improvising, with 9 participants agreeing and 4 participants strongly agreeing. Except for one participant, participants felt that they were able to come up with unexpected ideas.

Participants felt the system design encouraged play, mentioning elements such as the tutorial design (P3) and drag-and-drop interaction (P7). Additionally, a participant noted that repeated words and combinations by the system make it seem more game-like, comparing the regeneration of cards to “shuffling cards” (P3). Another aspect of the system mentioned by participants that fostered creativity was the lack of expectations placed on them. Participants expressed they were able to “grab things in [their] day and improvise with them” (P4). Many (11/13) felt that the playfulness enabled them to “feel creative again” (P5), or gave them the option to “escape [their] mindset on writing and try something different” (P10) leading them to “play around” with “whatever comes out” (P13). Some participants mentioned the system design allowed them to “be open to results [they] didn’t expect” and have “a more experimental frame of mind” (P14). As shown in Figure 3, participants frequently combined cards, regenerated text, and deleted text, showing their iterative flow while using Nabokov’s Cards. Overall, we found that supporting improvisation and play helped writers experiment and explore during early ideation states.

4.5.3 Encouraged modular and reflection thinking in writers. Nabokov’s Cards interface metaphor encouraged writers to assemble their writing into smaller modular subcomponents to reassemble and recombine. Writing cards into smaller components also forced self-reflection on their workflow. Participants focused on modularizing their texts based on various literary elements like character, perspective, tone, and word meaning. For instance, P11 created separate cards for each character and experimented with shifting perspectives by mixing character cards with cards containing scene information. They also introduced a notecard with the letter “I” on it and continuously combined it with different notecards to shift the texts into first person. Then, to shift the tone of a card, P11 tried combining the word “grief” with another card. In comparison, another participant used prompts on cards like “bring a more poetic atmosphere” (P12) and combined it with other cards. One participant likened the process to William Burroughs’ cut-up method, in which written text is cut up and rearranged to create a new text. Others described how the system enabled them to dissect sentences into “clauses and then piece clauses back together” (P3) to explore different effects, and another noted that working in “smaller increments” allowed them to “focus on the importance and delivery” (P10).

The modular thinking afforded by Nabokov’s Cards also afforded associative thinking. Writers could think of words or concepts which had an intuitive connection to them without having to declare from the outset what that connection

is. For instance, P1 began Day 2 of the study by combining the initial poem of “Pale Fire” with a study on ketamine. P1 did not have to have an idea of how Pale Fire and the study on ketamine might combine together into a story idea; rather, they needed an intuition that there may be an interesting connection between the two. Some participants (5/13) also noted that the system helped them see their work differently and pushed them to think beyond their usual patterns, for example, P12 said “[it helped me] connect two disparate thoughts”. The process of breaking down their texts and using AI to recombine made some participants reflect on their writing process as the system reminded them of their “inner monologue” (P12), enabled them to “see [their] own patterns” (P10), and was useful for “connecting pieces” (P1, P4, P5, P7). One participant mentioned that the system helped them notice their “own impulses/tastes for sentences” by looking at their preferences towards “syntax and word choice” (P14). Overall, we found that the system facilitated a bottom-up approach to the participants’ creative process, forcing them to look at the particulars of their texts and spark abstract ideas from these components.

4.5.4 Made limitations of LLMs a creative asset. We found that although participants felt frustrated with the LLM while using Nabokov’s Cards, they found creative methods to counteract LLM’s creative limitations. In prior works within LLM-assisted co-writing [48, 49, 74], writers often find themselves frustrated with the limitations of LLM-generated text. More than half of the participants (7/13) felt that the AI generated text was too focused on trying to be coherent when it combined text, so it lost the interesting qualities of both texts. From Figure 6, we can see that 7 participants felt that the LLM intervened in the act of writing and creatively. Also, 5 participants expressed agreement when asked if they felt frustrated with the system. Participants felt constricted by the LLM, expressing that the text outputs were too “*narrative based*” (P1), did not “*step out of the norm*” (P3), “*removed [their] personal voice*” (P7), gravitated towards “*clichés*” (P7), and was “*predictable [and] too generalized*” (P4). Moreover, the creative limitations of the LLM made participants more aware of the model’s inner workings and drew attention to AI’s distinct voice. Prior work has identified that deep language models generate manifolds with information pertaining to certain topics [39]. Participants (8/13) noticed that the generated text would often repeat certain words, and the regeneration feature would lead to a “*stagnation after 3 or 4 times*” (P12), causing the system to output “*versions of the same idea*” (P14). However, P13 thought the system was reminiscent of “*throwing dice*” where sometimes the system kept bringing the same thing up, but they enjoyed it. Other participants (4/13) felt that the repetition and stagnation of the generated text was partially due to a limitation in the length of the text generated.

However, echoing prior works [6, 63], we found that limitations and constraints during creative writing have the possibility to stimulate creativity for some participants. Instead of becoming disengaged, participants often tried to regenerate, recombine, delete, and try another combination of cards. Some participants who had prior experience working with AI had a prior expectation that the “*AI would be too linear, so I went for juxtaposition to fight against this*” and avoid generated text that became too “*smooth and overblown*” (P4). Another participant gravitated towards a sharp juxtaposition between “*unlikely companions*” like combining lines from “*The Waves*”, an experimental Virginia Woolf novel, with “*right-wing media*” (P1). Therefore, the restriction of the LLM could also serve as a writing constraint to stimulate creative thinking.

4.5.5 Promoted sense of collaboration with LLM . Participants felt that Nabokov’s Cards offered helped in refining their ideas and fostered a collaborative, open-ended prewriting process; however, they also expressed a desire for greater control over the generated text. In particular, participants found Nabokov’s Cards to feel “*more collaborative*” than a “*dialogical application like ChatGPT*” (P1) because it did not have “*a human personality*” (P1) so “*there’s more agency*” with the writer because “*you feel like you’re working with the AI*” rather than “*feed[ing] it the prompt or what you want*”, Manuscript submitted to ACM

and then it gives it back” (P3). As noted by P1, “*ChatGPT will jump straight to the product or to the answer [to] go to where you want to go for you ... this [system] doesn't know what you wanted to do and is just participating in your process it doesn't know what I want exactly, and I don't know what I want so we can kind of be in process together?*” However, due to the lack of personification, some participants felt that “*the AI [was] dumber because it did not have that human interface*” (P5).

Not all participants had a smooth relationship with the AI while using the system. From Figure 6, we can see that there was an even split in how participants felt about Nabokov’s Cards meeting their expectations. Some participants wanted Nabokov’s Cards to primarily infer their writing needs (3/13) while others wanted to be able to have more explicit control over the generated output (5/13). With respect to AI generated text, participants wanted greater explicit control over the generated text, noting how “*edits to the text didn't seem to persist*” (P3) and how they had to replace “*one word with another, hoping that it would inspire the regeneration*” (P12). As reflected in the frequency ratings, Figure 3, there was a large variation in how frequently participants edited and favoured cards. Interviews suggested some writers forgot the function of the favouriting feature. Overall, however, P3 and P12’s comments seemed to stem from a desire for more personalized systems that were “*fine-tuned*” (P9) from their material. In contrast to implicit feedback to the LLM, other participants wanted to set up an instruction area similar to ChatGPT where they could “*just tell it, ‘Hey I want something less verbose,’ and give it that kind of instruction*” (P4). So, while participants valued our implementation of an LLM as a creative assistant that supported ideation rather than dictating outcomes, their feedback highlighted a need for greater control, either explicitly or implicitly.

5 DISCUSSION

In this section, we discuss how the results of our long-term study can inform the design of LLM co-writing systems, the design of future studies of LLM co-writing systems, and AI systems that use LLMs for ideation more broadly. We discuss how, although Nabokov’s Cards did not prevent common complaints writers have about LLM-generated writing—the presence of clichés, redundancy, and lack of nuance [11]—it did help reframe the limitations of the LLM to be a creative constraint that fostered experimentation and play. We discuss how the results of our long-term study suggest that future AI co-writing systems should consider alternative means of conceptualizing and supporting customized modularity in their designs. We then discuss how Nabokov’s Cards implicitly encouraged prompt engineering through its interface and immediate output feedback, and how this might be useful for further work in human-LLM interaction. We end by discussing the value of diary studies in research on AI co-writing systems.

5.1 Affording Experimentation in AI Co-Writing Systems

During our long-term study, participants echoed many of the complaints reported in prior work with AI co-writing systems, i.e., that the AI generated too many clichés and seemed too rigid or redundant [26, 27]. Despite this, Nabokov’s Cards helped all but two writers generate a large number of ideas. Rather than meditating on content that they did not like or get stuck, participants attempted to “master” the system and try alternative strategies that avoided such roadblocks.

One reason Nabokov’s Cards may have encouraged participants not to be discouraged by poor LLM output was that it encouraged a spirit of play. The regeneration feature, for instance, encouraged writers to try multiple generations and combination. Future iterations of Nabokov’s Cards may benefit from making these regenerations more varied to encourage more experimentation. Additionally, Nabokov’s Cards was low-pressure because it was framed as a prewriting tool. Output from the LLM was assessed based on whether or not it contained interesting language or ideas,

not on how effectively it could immediately be deployed in a polished piece of writing. Further, the drag-and-drop functionality reminded some participants of past experiences with games. While past work has looked at drag-and-drop visual interfaces for collaborative authoring with LLMs [48], we recommend that further work focused on ideation and AI co-writing provide (1) multiple output options, (2) opportunities to work with fragments of text, and (3) opportunities for low-pressure and low-impact decisions about the resulting piece.

5.2 Reimagining Modularity in AI Co-Writing Systems

Modularity in AI-cowriting systems is commonplace, with many applications such as Sudowrite, NovelCrafter, and Squibler implicitly dividing pieces of writing into modules and components (e.g., the genre input window in Sudowrite, the character cards in Novelcrafter, or the narrative perspective drop-down menu in Squibler). These features enable creative writers to modulate one aspect of a literary text and encourage them to think about a piece of writing in terms of its components. Nabokov’s Cards, however, encouraged writers to devise their own forms of modularization in writing and incorporate them into their work. Past work has demonstrated the value of having users develop particular prompts which can be reapplied to a text as editing tools [49]. Nabokov’s Cards provides an additional means of thinking about this modularization by encouraging writers to write a fragment of text on a particular card and apply that card to another piece of text by “combining.” Future AI co-writing systems should consider how the framing of combining different fragments of words or prompts with particular words may support modularity. Additionally, modularity encouraged writers to reflect on their writing processes and approaches to writing by encouraging them to think critically about how these different subcomponents are combined. We recommend designing future AI co-writing systems with modular components to encourage reflection.

5.3 Encouraging Prompt Engineering in Human-AI Interaction

Prompt engineering has been identified as a valuable method for improving user outcomes, with prior research highlighting its role in refining human-AI interaction and enhancing the effectiveness of LLM-generated content [32, 37]. More recent studies have also emphasized the importance of scaffolding and assisting users in prompt engineering through graphical user interfaces (GUIs) and multimodal interventions [2, 18, 76]. While previous findings suggest that systematic approaches to prompt engineering are critical for creative outcomes in LLM-assisted brainstorming [13], Nabokov’s Cards, in contrast, emphasized the importance of dynamic, exploratory user interactions. Similar to studies that advocate for iterative refinement through immediate feedback [7, 65], Nabokov’s Cards encouraged users to experiment with input variations by providing rapid feedback through generated outputs and reinforcing iterative exploration via the “regenerate” function. Future iterations of Nabokov’s Cards may benefit from the inclusion of a “prompt box” that encourages users to interject a prompt into their writing. Other future work in AI co-writing and human-AI interaction should thus consider how immediate feedback and exploratory user interactions may enable users to think more deeply about their input to LLMs and encourage prompt engineering. In future LLM co-writing systems seeking to encourage prompt engineering, we recommend (1) breaking user input and LLM output into smaller components, but also (2) encouraging collaborative experimentation with LLMs through the combination and recombination of these components.

5.4 Importance of Long-Term Usage and Extended Observation in AI Co-Writing Studies

Our long-term study underscored the utility of diary studies and longitudinal methodologies in evaluating and understanding AI co-writing tools for creative writing applications. Unlike short-term usability studies, a longer engagement

period enables users to adapt the system to their ongoing regular writing practice. Many participants altered their approach to Nabokov's Cards over the course of the study, discovering varied uses for the AI on different days or acclimating to its affordances after an initial adjustment period. Some claimed to have their best experiences with the system in the latter days of the study, suggesting that early interactions may not fully capture an LLM-assisted writing tool's potential impact.

By employing a long-term study design, we observed a broader spectrum of use cases, giving researchers and participants a more nuanced understanding of the tool's value. Rather than speculating about hypothetical applications, participants could critically assess how the system functioned within their creative workflows. Furthermore, this method may have helped mitigate the novelty effect, which can lead to inflated enthusiasm or skepticism during an initial encounter with new technology [34]. Despite these advantages, few studies have employed longitudinal methods to investigate AI-assisted creative writing [27, 30]. Future research on AI co-writing, and particularly prewriting, should use such methods to better understand how usage evolves over time and how writers could meaningfully integrate such tools into their own practice and environments.

5.5 Limitations

Participants were recruited from the first author's social circle in the Toronto literary scene. A study which recruits participants from a variety of locations and genres may provide more broadly applicable findings. Further, despite all participants receiving instruction about the “favouriting” feature of the application before the study, a few writers expressed that they did not know the feature during exit interviews. Further work may benefit from reminding writers about this feature throughout the longitudinal study. Additionally, some interesting results may not have been included in the user diary logs. Future work may benefit from a more comprehensive logging system that also provides quantitative results.

6 CONCLUSION

Overall, our work demonstrates how LLM-assisted writing tools boost bottom-up creativity, foster improvisation, and promote modular thinking. By merging text fragments with an LLM, the system encouraged exploration and play, shifting AI-assisted writing from top-down generation to emergent creative discovery. Participants used Nabokov's Cards to generate unexpected connections and refine their prewriting habits. Despite common issues like redundancy and predictability, writers turned these into productive challenges, using juxtaposition and prompt engineering to push beyond conventional outputs. Nabokov's Cards afforded user-driven modularity, allowing flexible organization and recombination of ideas. Our study highlights the importance of long-term evaluation in LLM co-writing research. Writers adapted their use of the tool over time, integrating it deep into their workflows. Future research should explore design strategies that allows for experimentation with text fragments in a low-pressure environment. By treating LLMs as tools for creative discovery rather than structured production, Nabokov's Cards contributes to discussions on AI's role in writing, showing how LLMs can be used to support bottom-up creativity.

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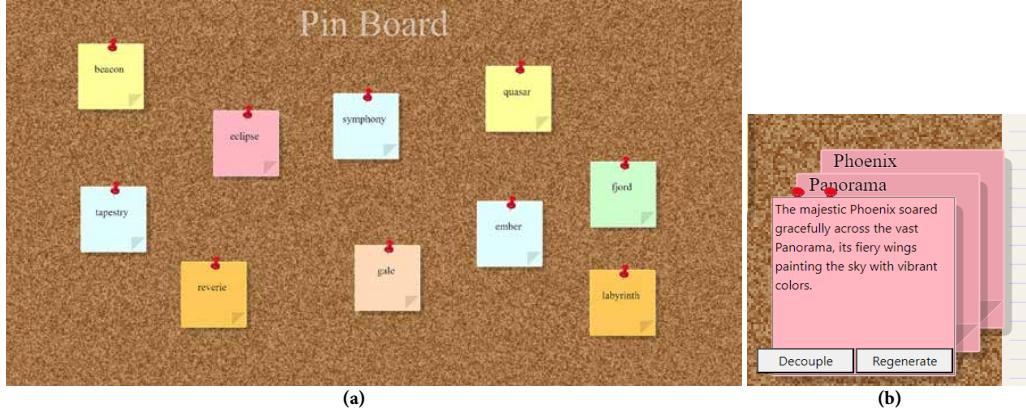


Fig. 7. First version of Nabokov's Cards showing (a) the full view loaded with sticky note-inspired cards filled with pre-generated words and (b) a snapshot of a coupled card in edit mode.

A APPENDIX

B PRELIMINARY STUDIES

We initially focused on refining the core system mechanics, usability, and interaction paradigms of Nabokov's Cards with HCI practitioners and undergraduate students. Professional writers, who are harder to recruit and require financial compensation, were not used in any of the early phases of our research due to their limited availability. HCI practitioners provided expert feedback on general usability, while undergraduate students in a course on AI in the arts that were trained to give feedback and think critically about AI's role in the creative process, offered more valuable insights. Following each of these studies, we iteratively redesigned Nabokov's Cards.

B.1 Pilot Study 1: Initial Feedback

B.1.1 Participants and Procedures. The goal of this study was to obtain feedback on the concept of Nabokov's Cards. We invited a group of three people from our social circle to participate in a pilot study of our application. The participants tested the features of the system, and a researcher conducted an unstructured interview with each of them after 15 minutes of use. They will be referred to as W1-3. The first version of the prototype interface can be seen in Figure 7.

B.1.2 Results. Most of the comments by participants during this pilot study involved screen space. Writer 1 wanted the content of the card to automatically resize based on the amount of text. We implemented this in the second version. All writers found that there was a lack of space to move cards on the screen, noting “*overlapping*” (W2) and feeling “*starved for space*” (W1). These comments led us to create a stash function to minimize and store cards without sacrificing screen space. Other features participants wanted included undo/redo (W3) and less wordy instructions (W1). We also addressed bugs in the system.

B.2 Pilot Study 2: Usability Study

B.2.1 Participants and Procedures. The goal of this study was to test the usability of the second version of Nabokov's Cards. Two members of the research team hosted an in-class workshop with 16 undergraduate students. Students were first given a 5-minute introduction to the application with a demo, then 30 minutes to write a story using the system

and reflect on the experience. After using the system, we came together as a class to discuss its usability. At the end of class, students were required to hand in their reflections and their stories.

B.2.2 Results. The two researchers read through all the student reflections and independently wrote comments based on the students' reflections. Most of the comments made by the students revolved around the text generated by the LLM. Firstly, students felt that the system dictated what type of story should be written, since by default, the system presented pre-filled notecards on initial load. Therefore, we removed these pre-filled cards. Secondly, it was not clear that the text generated by the LLM could be edited. To address this, we redesign the cards' edit mode to show a blinking *caret* cursor and a mono-spaced font to contrast with the serif font in view mode. Finally, the main issue with the generated text was with the prompts in the backend. Students felt that the prompts generated too much text, even with small inputs. Rather than combining words into phrases, phrases into sentences, sentences into paragraphs, and so on, the system too often generated whole paragraphs with made-up characters. Therefore, we implemented an algorithm to detect whether the input card contained a word, phrase, sentence, or paragraph. We then developed prompts for each possible combination of these types accordingly. See Appendix C. We also addressed bugs in the system.

B.3 Pilot Study 3: Week-long Usability Study

B.3.1 Participants and Procedures. The goal of this study was to test the length of our designed study and to detect any bugs in the system. We recruited four HCI researchers from our lab to participate in a tablet-based study. The procedure of this pilot mirrored that of the longitudinal study in this paper. We first had an onboarding session where we conducted semi-structured interviews about their prewriting process, followed by a demo of the system. We also asked the pilot participants to give feedback on the interview questions and speak up if they had difficulty understanding our demo. Each pilot participant was tasked with using the system over the week and recording diary logs. At the end, we conducted a group discussion to discover bugs and usability issues they encountered.

B.3.2 Results. Through this study, we refined the demographic questions and revised our semi-structured interview questions. We had originally planned for a tablet based study, but due to the number of bugs the pilot participants found, we decided to move the study to computer-only. The participants also found that output from LLMs contained too much "purple prose", so we revised the prompts to force the outputs to be simple and concise. See Appendix C.

C LLM PROMPTS

Below are the detailed prompts used for each type of combination:

- **Word + Word → Phrase:** The goal is to combine the following words together into a coherent phrase with a maximum of 7 words. Ensure the phrase aligns with the narrative style and avoids redundancy.
- **Word + Phrase → Sentence:** The goal is to combine the following word and phrase into one coherent sentence. Keep it concise and engaging.
- **Word + Sentence → Sentence:** The goal is to mix the following word with the sentence to create a cohesive narrative sentence. Maintain brevity and clarity.
- **Phrase + Phrase → Sentence:** Combine the following phrases into one or two compelling sentences. Ensure narrative coherence and stylistic interest.
- **Phrase + Sentence → Sentence:** Synthesize the following phrase and sentence into a concise, compelling sentence. Keep the structure simple and engaging.

- **Sentence + Sentence → Paragraph:** Merge the following sentences into a short, coherent paragraph. Focus on narrative flow and clarity.
- **Sentence + Paragraph → Paragraph:** Combine the sentence and paragraph into a concise narrative paragraph, maintaining coherence and interest.
- **Paragraph + Paragraph: Error:** Combining two paragraphs is not supported by this system.