GraphicWeaver: Benchmarking Agentic Planning for Graphic Design Generation

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Abstract

Vision-language model (VLM)-powered agents are increasingly enabling new forms of automation across various human tasks. While prior work has primarily focused on well-defined problems with explicit goals, the capabilities of agents in creative graphic design, where goals are inherently open-ended and subjective, remain largely underexplored. To bridge this gap, we introduce GraphicWeaver, a planning benchmark for graphic design comprising 1,079 diverse user queries and associated images spanning four design categories. Comprehensive experiments with six models reveal that current VLM-based agents struggle to handle such complex planning tasks, which require taking into account both explicit design constraints specified in queries and implicit commonsense design principles. We attribute these failures to challenges in (1) retrieving appropriate parameters for tool usage, (2) understanding spatial relationships across design components, and (3) coordinating dependencies across agents. We envision GraphicWeaver as a challenging yet valuable testbed for advancing VLM agent planning in creative design contexts.[1]

1 Introduction

Recent advancements in Vision-Language Models (VLMs) have expanded their potential as general-purpose agents capable of automating a wide range of human tasks. Prior work has evaluated VLM agents in diverse domains, including web navigation and interaction (Zheng et al., 2024; He et al., 2024a; Tian et al., 2025), travel planning (Xie et al., 2024; Jandial et al., 2025), item detection (Kelly et al., 2024), embodied scenarios (Zheng et al., 2023), and online shopping (Koh et al., 2024).

On the other hand, research on the planning capabilities of VLM agents for *creative* design tasks remains limited, primarily due to underspecified open-ended goals from users (Guo et al., 2024; Ge et al., 2025). They require delicate planning that translates a high-level user request into a structured plan composed of executable sub-tasks that collectively produce the final design. This is inherently complex, posing multiple challenges: **(1)** A complex design often requires collaboration involving multiple agents; **(2)** Design planning is usually *long-horizon*, involving a sequence of decisions for expert selection, tool calls, and tool uses, with an expansive tool space to explore (Xie et al., 2024); **(3)** A design plan must accommodate both explicit constraints from user queries (e.g., "the title text color must be white") and implicit constraints inferred through commonsense reasoning (e.g., "the background should contrast with the color of text elements") since user queries are often incomplete with unspecified details (Qian et al., 2024b); **(4)** Assessing design outcomes is inherently subjective, as the notion of what constitutes a *better* design vary across individuals. These challenges raise a key question: To what extent can VLM agents generate cohesive plans for creative design tasks when provided only with open-ended user queries?

We focus on graphic design, a task that remains challenging even for humans as it demands specialized knowledge of professional design tools, often requiring substantial time and effort to learn (Bedford et al., 2006). In this work, we introduce **GraphicWeaver**, a planning benchmark comprising 1,079 realistic user queries paired with associated images. The dataset spans four representative design categories: book cover, business card, postcard, and poster, chosen to capture a broad range of design goals varying in layout composition, textual arrangement, and overall visual organization (§3).

We comprehensively evaluate six VLM-based agents, ranging from smaller open-weight models to larger closed-source ones (§4). As shown in Figure 1, each agent is assessed on its ability to reason about task requirements and devise actionable plans

[1] Code and data will be released upon publication.

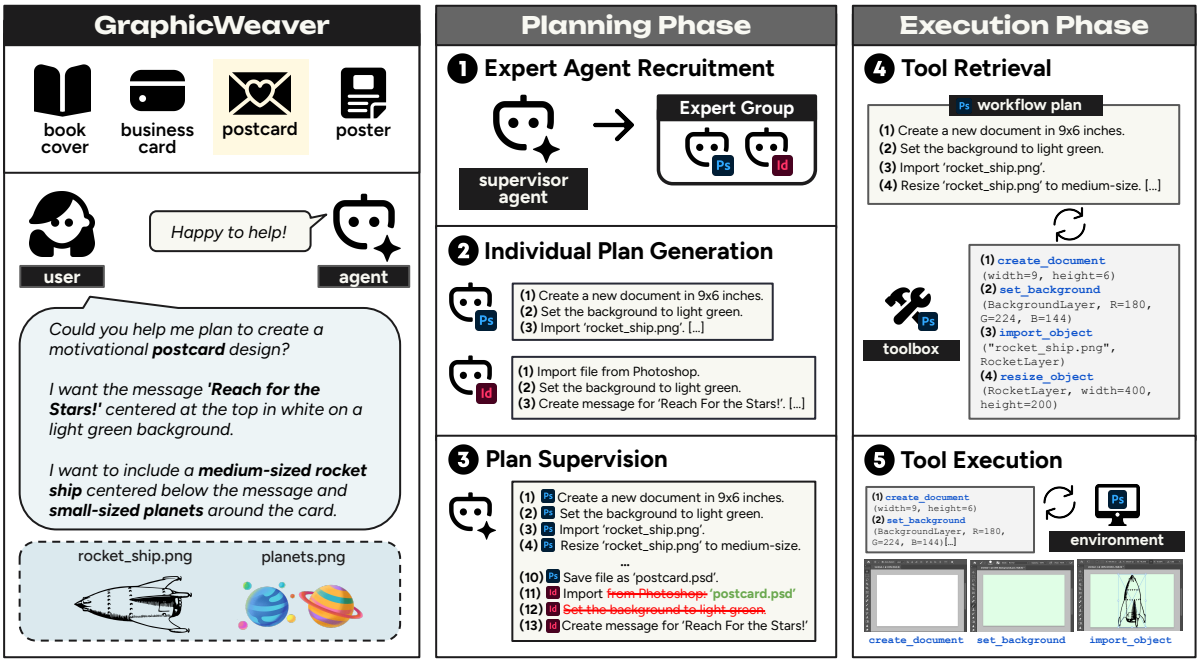

Figure 1: Overview of GraphicWeaver. Given a user query and associated image(s), vision-language agents collaboratively *plan* and *execute* the requested task. They generate a plan that satisfies the user's requirements expressed in the query while adhering to implicit commonsense design principles. Based on the finalized plan, each agent retrieves the appropriate tools and executes them within its respective environment.

(Planning; §5.2) and to retrieve and execute appropriate tools to achieve the desired goal (Execution; §5.3). Our key findings are summarized as follows:

- All evaluated VLM-based agents struggle with complex planning tasks in GraphicWeaver, particularly in integrating both explicit user-specified requirements and implicit commonsense design principles into the generated plans.
- Execution success rates are generally low, with GPT-4.1 (the highest performing model) successfully executing only 62.5% of its generated plans. The resulting design outcomes receive low scores for both alignment with user queries and images, as well as for overall creativity.
- Further analyses reveal three recurring failure modes: (1) retrieval of invalid parameters for tool usage, (2) difficulty in reasoning about spatial relationships of design components, and (3) inadequate coordination across agents.

2 Related Work

VLM-Based Agents. Leveraging the strengths of Large Vision-Language Models (LVLMs), VLM-based agents have shown strong performance in automating human tasks through tool use (Schick et al., 2023; Qin et al., 2023) and advanced reasoning strategies (Yao et al., 2022; Shinn et al., 2023). Further inspired by human collaboration and its role in improving work efficiency (O'Reilly et al., 1997; Woolley et al., 2015), recent research has proposed multi-agent frameworks in which multiple agents coordinate to solve a shared task (Ding et al., 2023; Shen et al., 2023; Dong et al., 2024; Chen et al., 2024). In particular, studies suggest that assigning specialized roles to agents improves their effectiveness on complex problems (Li et al., 2023; Talebirad and Nadiri, 2023; Du et al., 2024; Hong et al., 2024; Qian et al., 2024a). Similarly, we evaluate VLM agents in a collaborative setting, but in the context of an underexplored problem in this space: graphic design generation.

Graphic Design Generation. Graphic design is a form of visual art that combines multimodal elements (e.g., images, texts, and vector symbols) to create aesthetic compositions that effectively communicate user's intent (Cheng et al., 2024). Most prior work has examined specific design *subtasks*—including layout generation (Li et al., 2019; Gupta et al., 2021; Jiang et al., 2023), typography generation (Zhao et al., 2018; Jiang et al., 2019), attribute recognition (Lin et al., 2024), and colorization (Yuan et al., 2021; Qiu et al., 2023)—as well as *single-shot* generation (Hsu et al., 2023; Seol et al., 2024; Yang et al., 2024b). In contrast,

Category	Example User Query	Example Image(s)	# Train/Test
Book Cover	We need to create a cooking book cover design titled 'Quick & Easy Weekday Meals' with the author's name 'Sarah James' at the top center, above the title, and a subtle green background. The title should be in white, top center, below the author's name, and feature a delicious pasta plate centered in the middle, below the title text. Include the tagline 'Delicious Recipes for Busy Lives' in white, below the title.		5/260
Business Card	Create a business card design in teal background for a software company named 'OceanSoft'. Please include the company name in huge white font at the top center. I want to include the tagline 'Sailing to Success' in medium white font placed below the company name and a large wave icon at the bottom center.		5/203
Postcard	Could you draft a plan to create a wedding announcement postcard design with the message 'Save the Date' centered at the top in white on a navy blue background? I want to include medium-sized golden wedding rings centered below the message and small elegant florals in the corners.		5/260
Poster	I need to create a poster design for a music festival named 'Rhythm Beats' on a green background, featuring a large illustration of a colorful guitar in the center, a catchy title 'Rhythm Beats' in huge white font at the top center, and a tagline 'Feel the Music in Your Soul' in large white font at the bottom center.		5/336

Table 1: Examples of user queries and images in GraphicWeaver. Each user query is paired with one or more relevant images that serve as inputs to the design planning process.

GraphicWeaver evaluates VLM agents on their ability to plan end-to-end designs through multi-step generation across multiple agents and web-based environments, more closely mirroring real-world graphic design practices (Inoue et al., 2024).

3 GraphicWeaver

3.1 Overview

We introduce GraphicWeaver, a benchmark for evaluating VLM agents on complex planning and tool use across multiple web-based design environments. To reflect real-world design planning, GraphicWeaver incorporates diverse constraints, including those explicitly specified in the user queries (Figure 1) and those arising from commonsense design principles, such as choosing background colors that contrast with text elements. The benchmark comprises 1,079 query-image pairs across four graphic design categories: book cover, business card, postcard, and poster. It is split into training and test sets: the training set contains 5 queries per category with human-annotated reference plans (20 in total), and the test set contains the remaining 1,059 queries, with detailed examples and statistics reported in Table 1.

3.2 Benchmark Construction Pipeline

This section outlines the construction pipeline of GraphicWeaver, which consists of the following steps: environment setting, diverse user query design, image pairing, and human quality checking. All prompts are outlined in Appendix D.1.

Environment Setting. In GraphicWeaver, we construct a static, closed sandbox environment for evaluation, ensuring that all VLM agents operate under the same fixed set of resources and eliminate any variability for fair comparison. It also avoids the overhead of building and maintaining custom environments, which is particularly challenging in graphic design domains. We consider three complementary design environments: Adobe Photoshop, Illustrator, and InDesign, each offering distinct capabilities. For each environment, we build a database with 46 tools in which every tool is linked to an executable JavaScript code corresponding to a single mouse or keyboard operation (e.g., creating a new document) (He et al., 2024b) and parameterized only by predefined input fields. As summarized in Table 2, we group tools into four categories: basic operations, drawing, text-related, and object manipulation functions.[2] For additional details on the toolset and environment configuration, refer to Appendix B.1.

User Query Construction. To construct diverse queries for GraphicWeaver, we first create human-annotated reference plans that identify key design components and sub-components for each design category, as shown in Table 3. To ensure the benchmark reflects real-world design needs, we collect screenshots of design projects shared by practitioners on the Behance platform.[3] Three graduate students familiar with Adobe software then collaboratively write realistic user queries and corresponding plans, and execute these plans in our sandbox environment to produce final designs that closely resemble the reference screenshots (see Appendix

[2]We derive the tools from Adobe's official tutorials, reflecting commonly used operations among design practitioners.

[3]https://www.behance.net/

Category	Tool	Input Parameters	Description	Env.
Basic	`SetBackgroundColor`	`red, green, blue`	Set the background color to desired RGB color.	Ps Ai Id
	`SaveDocument`	`fileName, format`	Save the current document into desired format.	Ps Ai Id
Drawing	`OpacityDrawing`	`layerName, opacity`	Adjust opacity of a drawing.	Ai
	`ResizeDrawing`	`layerName, width, height`	Resize a drawing to desired width and height.	Ai
Text	`ApplyFont`	`layerName, fontName`	Apply font to text.	Ps Ai Id
	`RotateText`	`layerName, angle`	Rotate text to desired angle.	Ps Ai Id
Object	`ImportObject`	`fileName, layerName`	Import an image or object from file path.	Ps Ai Id
	`PhotoFilter`	`layerName, filterType, density`	Apply a photo filter to an object with desired density.	Ps

Table 2: Subset of available tools in GraphicWeaver. Each tool is parameterized by predefined input fields for execution. **Env.**: Environment which supports the execution of a specific tool. Full list of available tools is in Appendix **??**.

Category	Design Components	Required?
Book Cover	Background color	✓
	Title (content, size, color, position)	✓
	Author Name (content, size, color, position)	✓
	Subtitle (content, size, color, position)	✗
	Tagline (content, size, color, position)	✗
	Image (size, position, image URL, caption)	✓
Business Card	Background color	✓
	Brand Name (content, size, color, position)	✓
	Tagline (content, size, color, position)	✗
	Contact Details (content, size, color, position)	✗
	Image (size, position, image URL, caption)	✓
Postcard	Background color	✓
	Message (content, size, color, position)	✓
	Image (size, position, image URL, caption)	✓
Poster	Background color	✓
	Title (content, size, color, position)	✓
	Tagline (content, size, color, position)	✗
	Image (size, position, image URL, caption)	✓

Table 3: Key design components and sub-components for each design category. Sub-components are listed in parentheses. **Required?:** Whether the component is required in the user query during query construction process.

B.2 for more details).

For each design category, the identified design components are used as placeholders to construct query skeletons, which serve as prompt templates (Qian et al., 2024b; Xie et al., 2024; Yoran et al., 2024). We then prompt GPT-4 (Achiam et al., 2023) to randomly fill these placeholders and manually introduce additional variation in query openers (e.g., "Please help me create a design [...]", "Could you provide me a design [...]") to better reflect the range of natural phrasing in real user queries, as illustrated in Table 1.

Directly using model-generated queries often results in many with highly similar design concepts (i.e., multiple postcards themed around "Birthday"). To diversify this, we remove near-duplicates by (1) discarding queries with overlapping bi-grams in any design components, and (2) filtering out semantically similar pairs with SentenceBERT similarity scores above 0.8 (Reimers and Gurevych, 2019).

Image Pairing. Each validated user query includes a brief description of the image(s) required for the design (see Figure 1). To ground these descriptions in concrete visual assets, we construct an image retrieval pool by collecting vector illustrations from OpenCLIPArt[4] and Public Domain Vectors.[5] In total, we gather 274K caption-image URL pairs as our retrieval pool. For each query, we then retrieve the top-3 candidate images whose captions have the highest SentenceBERT similarity scores with the query's image description.[6]

Quality Control. We first conduct an automatic evaluation to assess the quality of the user queries and the top-3 retrieved images. For each query, we prompt GPT-o1[7] to: (Q1) identify the key design components and rate how well each contributes to the coherence of the final design on a five-point Likert scale (1:Not at all, 5:Completely), and (Q2) rank the three retrieved image candidates from 1 (best fit) to 3 (least fit) based on their relevance.

To validate these automatic annotations, we conduct a human verification study on a stratified random sample of 200 user queries (50 per design category) using the same criteria. We observe substantial agreement between GPT-o1 and human judgments (Cohen's κ=0.586 for Q1 and Kendall's τ=0.671 for Q2). We discard queries in which any design component receives a rating of 1 or 2 and retain only the image ranked as the best fit. Further details are provided in Appendix B.3.

3.3 Evaluation

We evaluate both the plans and the execution outcomes offered by agents along multiple dimensions.

[4] https://openclipart.org/

[5] https://publicdomainvectors.org/

[6] All images will be released under the Creative Commonsense Zero (CC0) license. The average text/image counts per query are: book covers (3.05/1.00), business cards (2.15/1.33), postcards (1.03/1.28), and posters (1.99/1.04).

[7] https://openai.com/o1/

Detailed prompts are provided in Appendix D.2.

(1) Planning Evaluation

- **Delivery Rate:** This assesses whether agents can successfully deliver a final plan within a limited number of steps, determined by difficulty: Easy (1 expert, 10 steps), Medium (2 experts, 20 steps), Hard (3 experts, 30 steps).[8] Plans that exceed the limit are counted as failures (Xie et al., 2024).
- **Design Pass Rate:** This measures if the plan correctly reflects both *explicit* user-specified constraints and *implicit* commonsense principles. We prompt GPT-5[9] to score color, text, and imagery alignment on a five-point Likert scale.
- **Step Efficiency:** This metric represents the proportion of unique (non-duplicate) to total steps.
- **Expert Use Efficiency:** This metric captures how effectively a plan minimizes switching between expert agents. For a plan p with N steps and E unique experts:

$$\textbf{ExpertUseEff.}(p) = \frac{E-1}{\sum_{i=1}^{N} \mathbb{1}(\text{expert}_i \neq \text{expert}_{i-1})} \quad (1)$$

(2) Execution Evaluation

- **Execution Success Rate:** This measures the proportion of plans executable without errors.
- **Fidelity:** This metric captures whether the required user images appear in the final outcome, measured via template matching (`opencv`).
- **Content Similarity:** Semantic alignment between the user query and the final outcome, measured using CLIPScore (Hessel et al., 2021).
- **VQA Pass Rate:** This metric measures how well the final design outcome reflects the components specified in the user query, using Visual Question-Answering (VQA) (Agrawal et al., 2016). For each query, we use GPT-4 to generate component-based questions,[10] and then answer them with LLaVA-1.5 13B (Liu et al., 2024). Pass rate is the average Yes/No accuracy (Zhao et al., 2024).
- **Creativity:** Following Torrance (1966); Runco and Jaeger (2012), we assess Originality (uniqueness) and Elaboration (extent to which the design expands on the user query by adding meaningful details) on a five-point Likert scale using GPT-5.

[8] Step limits are based on human-annotated plans.

[9] https://openai.com/gpt-5/

[10] On average, 9.07, 10.0, 7.89, 8.70 questions are generated per user query for book covers, business cards, postcards, and posters, respectively. Examples are in Appendix B.4.

4 Experiment Setup

Models. We focus on VLMs with input context lengths of at least 32K tokens due to the extensive information required for planning. We evaluate four open-weight models of varying sizes and families: Qwen-2.5-VL 7B and 32B (Bai et al., 2025), Gemma-3 12B and 27B (Team et al., 2025), and two closed-source models: GPT-o4-mini[11] and GPT-4.1.[12] We use temperature of 0.0.[13]

Planning Strategies. To study the impact of agentic planning, we compare two strategies: direct and agentic. In the direct mode, a single VLM agent generates the entire design plan without invoking the multi-step planning process illustrated in Figure 1. In the agentic mode, we adopt a hierarchical framework where a supervisor VLM agent a_s coordinates a group of expert agents $a_i \in \mathcal{A}$ for planning (Fourney et al., 2024; Zhang et al., 2025).

Specifically, for each user query, the supervisor agent a_s assembles an expert group $\mathcal{A}$ based on predefined role descriptions and assigns a high-level goal to each expert agent $a_i \in \mathcal{A}$. We instantiate three design experts, each aligned with one of our three design environments (§3.2) and prompted with distinct expertise and responsibilites:

- **Photo Editor:** An agent with an expertise in Ps Adobe Photoshop, responsible for image editing, color correction, and applying filters.
- **Vector Graphic Editor:** An agent with an expertise in Ai Adobe Illustrator, focused on creating and editing vector illustrations.
- **Layout Designer:** An agent with an expertise in Id Adobe InDesign, responsible for customizing layout templates, exporting files, and integrating text with visual elements.

Each expert VLM agent a_i then proposes its own plan p_i conditioned on its assigned goal. To emulate human problem-solving process (Zhu et al., 2023), each a_i is instructed to plan with a sequence of actionable steps (Yang et al., 2024a; Wu et al., 2024b; Zheng et al., 2025), which further facilitates accurate tool retrieval (Huang et al., 2024). The supervisor then overlooks these individual plans in terms of the overall goal and merges them into a single cohesive plan p_s, which is then executed sequentially, yielding the final design outcome.

[11] https://openai/com/o3-and-o4

[12] https://openai.com/index/gpt-4-1/

[13] HuggingFace model names are in Appendix A.

Model	Planning				Execution					
	Delivery Rate (%)	Design Pass Rate (%)	Step Eff.	Expert Use Eff.	Success Rate (%)	Fidelity	Content Similarity	VQA Pass Rate (%)	Creative (O)	Creative (E)
Direct mode										
QWEN-2.5-VL 7B	27.1	22.5	45.5	0.98	10.3	0.01	5.70	16.0	1.05	0.64
QWEN-2.5-VL 32B	57.3	19.7	56.0	**1.00**	17.5	0.04	6.62	19.0	1.18	1.07
GEMMA-3 12B	37.7	19.0	63.8	0.99	14.9	0.03	6.93	13.6	1.18	0.76
GEMMA-3 27B	**67.8**	24.7	70.9	**1.00**	22.3	0.09	9.30	17.7	1.09	1.10
GPT-O4-MINI	46.2	23.3	79.5	**1.00**	28.0	0.11	8.70	21.5	1.14	1.13
GPT-4.1	30.3	**30.1**	**82.5**	**1.00**	**29.5**	**0.13**	**13.1**	**23.3**	**1.39**	**1.36**
Agentic mode										
QWEN-2.5-VL 7B	15.2	51.8	92.0	**1.00**	39.4	0.15	22.5	37.6	1.77	1.59
QWEN-2.5-VL 32B	39.6	49.7	92.4	**1.00**	61.3	0.20	22.3	35.5	1.89	1.65
GEMMA-3 12B	27.3	54.5	96.5	**1.00**	58.1	0.17	21.0	36.2	2.01	1.68
GEMMA-3 27B	**51.4**	54.4	93.1	**1.00**	55.4	0.20	26.7	44.7	1.98	2.04
GPT-O4-MINI	20.8	51.1	97.1	**1.00**	56.5	0.20	28.3	**44.9**	1.78	1.99
GPT-4.1	13.9	**56.8**	**94.7**	**1.00**	**62.5**	**0.21**	**29.3**	44.7	**2.02**	**2.06**

Table 4: Planning and execution results of different VLMs and planning strategies on GraphicWeaver. For each planning mode, column-wise best scores are **bolded** and second-best scores are underlined. All metrics are interpreted as higher values for better performance (↑). Scores are aggregated over the four design categories; per category results are provided in Appendix C.1.

5 Results

We discuss the performance of various VLM agents across planning strategies (§5.1) on GraphicWeaver in terms of planning (§5.2) and execution (§5.3).

5.1 Direct vs. Agentic Mode

As shown in Table 4, all VLM agents perform worse in the direct mode than in the agentic mode on nearly all metrics, with the exception of delivery rate. We attribute the higher delivery rate in direct mode to the fact that directly generated plans are typically shorter, and thus more easily satisfy the maximum number of steps constraint. Expert use efficiency also remains close to perfect in the direct mode, since most models tend to persist with a single expert agent throughout the entire plan rather than switching between experts.

Other planning and execution metrics are substantially lower in the direct mode, with the largest gap reaching over 30%. For instance, design pass rate drops from 53.1% (agentic) to 23.2% (direct) on average, step efficiency from 94.3% to 66.3%, and execution success rate from 55.5% to 20.4%. Together, these results highlight the importance of an agentic framework for complex design planning, suggesting that decomposing the task and coordinating specialized experts is more effective than asking VLMs to plan in one-shot.

5.2 Planning

In the agentic mode, all evaluated VLM agents still struggle to deliver plans within the step limit on GraphicWeaver. GEMMA-3 27B achieves the highest rate at only 51.4%, with all other models remaining below 40%. Design pass rates are also modest, indicating difficulty in jointly satisfying explicit user-specified requirements and implicit commonsense design constraints: GPT-4.1 achieves the highest design pass rate at 56.8%, while QWEN-2.5-VL 32B scores the lowest (49.7%). In contrast, step efficiency and expert use efficiency remain relatively high, suggesting that the generated plans contain only a few redundant steps and avoid unnecessary switching between expert agents.

Across the four design categories, poster plans achieve the highest design pass rate (54.8%), whereas business card plans exhibit the lowest delivery and design pass rates. This is likely due to the higher number of text elements and, for some queries, the added complexity of planning designs for both the front and back of the card. Detailed per-category results are reported in Appendix C.1.

5.3 Execution

Execution metrics are also low across all evaluated VLM agents. The proportion of plans that fully execute ranges from 39.4% for QWEN-2.5-VL 32B to at most 62.5% for GPT-4.1. Even among successfully executed plans, the resulting design outcomes

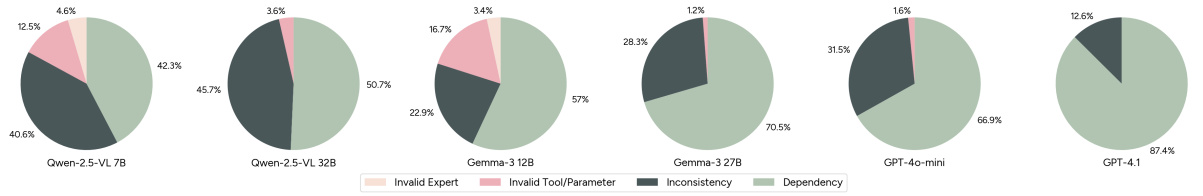

Figure 2: Error distribution for each VLM. For all tested models, majority of the errors stem from inconsistent planning across design components (Inconsistency) or failing to resolve dependencies across steps in design plans (Dependency).

receive low scores on measures of alignment with both user queries and images. For example, fidelity to the user images remains around 0.10-0.20 across models, with the best score of 0.21 achieved by GPT-4.1. Semantic similarity between user queries and final designs is likewise limited, ranging from 21.0% for GEMMA-3 12B to a maximum of 29.3% for GPT-4.1. None of the VLMs achieve a VQA pass rate above random chance (50% for Yes/No accuracy), with the highest score being 44.9% for GPT-O4-MINI. Additionally, the overall creativity of the generated design outcomes, as judged by GPT-5, remains low on both originality (O) and elaboration (E), with all models scoring roughly between 1.5 and 2.0 on these scales.

Taken together, these results show that GraphicWeaver presents a substantial challenge for current VLM agents: even the state-of-the-art VLMs, when equipped with agentic planning strategy, still fall short of planning and successful execution in complex graphic design tasks.

6 Analysis

We present further analysis on the agentic mode.

6.1 Expert & Tool-Use Analysis

We visualize the distribution and flow of expert agents in the generated plans in Figure 3. On average, 2.11 expert agents are recruited per user query. Across models, the Photo Editor and Layout Designer are most frequently paired, reflecting their complementary roles, whereas the Vector Graphic Editor is used less often since most queries already specify images to incorporate into the planning. The Layout Designer is responsible for the largest share of steps (15.2 on average), followed by the Vector Graphic Editor (10.4) and the Photo Editor (8.24). In terms of agent ordering, models exhibit clear preferences: the most common transition is Photo Editor → Layout Designer (43.3% of transitions), followed by Layout Designer → Photo Editor (21.5%) and plans that use only the Layout Designer accounting for 17.8% of cases.

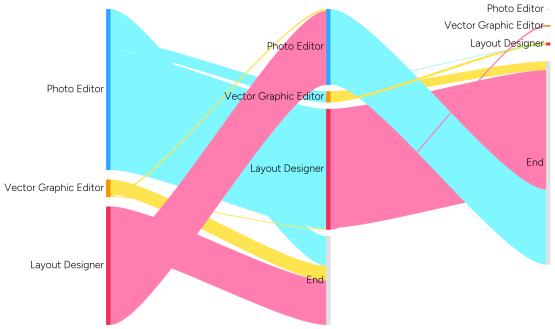

Figure 3: Aggregated expert agent usage ordering. Most common order is Photo Editor → Layout Designer.

As further detailed in Appendix C.2, expert agents consistently rely on only a small subset of their available tools: the Photo Editor primarily performs object manipulation, while Layout Designer focuses on text operations. The most frequent tool usage sequences closely resemble workflows in human-annotated references (e.g., document creation → set background color → import and manipulate images → text), indicating that previously observed human-like reasoning patterns (Wei et al., 2023) possibly extend to graphic design planning.

6.2 Error Analysis

We categorize step-level errors in the generated plans into four types, as illustrated in Figure 2: **(1) Invalid Expert**, where a non-existent agent is assigned; **(2) Invalid Tool/Parameter**, where tools outside the defined toolset or non-defined parameters are selected; **(3) Inconsistency**, where a step's assumptions conflict with design components, and **(4) Dependency**, where an operation references an object that is unavailable or uninitialized. We summarize our main findings as follows:

1. **Dependency errors dominate**, accounting for 62.5% of all errors. These include both *local* (within-agent) and *global* (across-agent) dependencies. All models particularly struggle with

global dependencies, often failing to correctly reference objects instantiated by other agents. We also observe that the proportion of dependency errors among all errors tends to increase for larger, closed-source models.

2. **Inconsistency errors are also common**, accounting for 30.3% of errors across all tested models. These typically occur when a plan contains mutually incompatible assumptions about the target design—for example, fist specifying that an element should be centered, then later introducing steps that place other elements in the same position. This is consistent with previously reported spatial reasoning limitations of VLMs (Yamada et al., 2024; Wu et al., 2024a).
3. **Invalid tool or parameter errors** are particularly common in smaller, open-weight models (the QWEN-2.5-VL and GEMMA-3 families). These errors often stem from hallucinated tools (e.g., `CreateTextAndResize`) or incorrect tool choices (e.g., mapping "*Move the title to the center.*" to `RepositionObject` instead of `RepositionText`), even when the full toolset is provided, underscoring the need for more reliable tool retrieval mechanisms.

Overall, VLM agents primarily struggle with global dependency handling and spatial reasoning, highlighting the need for more robust reasoning over design components and improved dependency resolution approaches.

7 Conclusion

We introduce GraphicWeaver, a planning benchmark grounded in real-world graphic design needs, to assess the complex design planing and tool-use capabilities of current vision-language agents. Our comprehensive evaluation of six VLMs show that GraphicWeaver remains highly challenging even for state-of-the-art models with an agentic planning strategy: agents struggle both to reason over user queries and to devise actionable plans, as well as to retrieve and execute appropriate tools to achieve the target design outcomes. Error analysis further reveals systematic weaknesses in tool selection, understanding spatial relationships across design components, and, most critically, recognizing and handling global dependencies across agents.

We envision GraphicWeaver as a stepping stone toward building more capable graphic design assistants, grounded in realistic tasks and constraints. We hope our work spurs future research on advancing planning in more open-ended creative tasks.

8 Limitation

Our study comes with certain limitations:

- GraphicWeaver assumes a scenario in which user queries explicitly specify the text and image elements, as well as the precise attributes such as color and text position. However, in realistic settings, users may not always specify or even know exactly what images to include in a design, or they may express their requests at a very high-level (Ge et al., 2025). Future works can explore scenarios where user input is limited, requiring models to seek clarification through interactions with users (Qian et al., 2024b; Li et al., 2024).
- The number of tools available in GraphicWeaver is currently limited to a fixed set of 46, as each corresponding JavaScript code was manually written by the authors. This set is not exhaustive of all possible tools within the three design environments. Future works can investigate automated methods for dynamically generating and retrieving tools (Yuan et al., 2024) or integrate a retrieval-augmented generation module (Lewis et al., 2021) into tool retrieval pipeline to enable agents make more informed decisions. Additionally, GraphicWeaver is currently limited to four design categories (book cover, business card, postcard, poster) and only considers three design expert agents, which does not cover the full range of design variants in graphic design tasks.
- Our experiments primarily focus on evaluating the performance of VLMs' capabilities in design planning. Supporting Large Language Models (LLMs) would require a different setup, including prompting with image captions instead of raw images, which is available in GraphicWeaver. Moreover, our agents operate in a stateless planning environment, relying only on the user query and the provided toolset. This allows us to isolate and evaluate the VLMs' planning capabilities, independent of environmental feedback. We view extending our work to support LLMs and perceptual tools as a valuable future direction.
- The scope of our experiments is constrained by computational and API budgets: we focus on open-weight models that can be run locally and closed-source models within our cost limits. Consequently, our findings may not fully generalize to other model families or larger-scale models.

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A HuggingFace Models

HuggingFace model names for open-weight models are listed in Table 5.

Model	HuggingFace Name
QWEN-2.5-VL 7B	`Qwen/Qwen2.5-VL-7B-Instruct`
QWEN-2.5-VL 32B	`Qwen/Qwen2.5-VL-32B-Instruct`
GEMMA-3 12B	`google/gemma-3-12b-it`
GEMMA-3 27B	`google/gemma-3-27b-it`

Table 5: HuggingFace model names for the tested open-weight models.

B GraphicWeaver Construction Pipeline

B.1 Environment Setting

The complete list of 46 available tools in GraphicWeaver is provided in Table 6. All tools are derived based on Adobe's official tutorial videos, which provides a diverse range of commonly used operations by graphic design practitioners. In Figure 4, we further show an example of one executable JavaScript code for `AdjustBC` tool for the Photo Editor agent.

B.2 Human Annotation

We present examples of human-annotated user queries for each design category in Table 7. Annotators are instructed to use the same design environment(s) as those employed in the original reference designs.

B.3 Quality Control

We detail the human annotation process as part of constructing GraphicWeaver. We built our custom annotation interface as illustrated in Figure 5. We invited 8 students to participate and provide a compensation of 10 USD gift card each. Before the survey, we show examples of both successful and failed cases to provide some context of annotation standards to annotators.

As part of the pre-survey, annotators were asked two questions on a five-point Likert scale: **(1) Design tool usage:** How often do you use design tools in daily work and life? (1:Never, 5:Always) and **(2) Adobe software usage:** How familiar are you in using Adobe software (e.g., Photoshop, Illustrator)? (1:Not familiar at all, 5: Extremely familiar). Of the 8 annotators, for design tool usage, 3 responded "Never" (Never in the past month), 4 "Rarely" (Fewer than once a week), and 1 "Sometimes" (two or three times a week). For Adobe software usage, 3 were "Not familiar at all" (have never used it before), 2 "Slightly familiar" (have some basic knowledge but have rarely used it), and 3 "Moderately familiar" (can perform simple tasks but may need guidance for more complex features).

B.4 VQA Examples

We present several examples of generated questions for measuring VQA pass rate as part of the execution evaluation are detailed in Table 8.

C Detailed Results

C.1 Planning & Execution Evaluation

We provide the full numerical results by VLM and design category for all planning and execution metrics in Table 9 (direct) and Table 10 (agentic).

C.2 Tool-Use Analysis

We present the top-3 most common tool-use sequences for each VLM in Table 11. We find that many of the sequences closely follow human-annotated workflows, typically starting with document creation (`CreateDocument` or `CreateDocumentCustom`), setting the background color (`SetBackgroundColor`), importing images as objects (`ImportObject`), manipulating the imported object (such as using `ResizeObject`, `RepositionObject`, etc.), saving the document (`SaveDocument`), and manipulating text elements (`CreateText`, `ApplyFont`, `ColorText`, etc.).

Category	Tool	Input Parameters	Description	Env.
Basic	CreateDocument	docType	Create new document with pre-defined dimensions.	Ps Ai Id
	CreateDocumentCustom	width, height	Create new document with desired width and height values.	Ps Ai Id
	SetBackgroundColor	red, green, blue	Set the background color to desired RGB color.	Ps Ai Id
	SaveDocument	fileName, format	Save the current document into desired format.	Ps Ai Id
Drawing	DrawCircle	layerName, radius, red, green, blue	Draw a circle of desired radius and RGB color.	Ai
	DrawEllipse	layerName, majorRadius, minorRadius, red, green, blue	Draw an ellipse of desired radius and RGB color.	Ai
	DrawLine	layerName, startX, startY, endX, endY, strokeWidth, red, green, blue	Draw a line of desired length, stroke, and RGB color.	Ai
	DrawPolygon	layerName, sides, radius, red, green, blue	Draw a polygon of desired number of sides, radius, and RGB color.	Ai
	DrawRectangle	layerName, width, height, red, green, blue	Draw a rectangle of desired size and RGB color.	Ai
	DrawStar	layerName, numPoints, radius, red, green, blue	Draw a star of desired number of points, radius, and RGB color.	Ai
	DrawTriangle	layerName, base, height, red, green, blue	Draw a triangle of desired size and RGB color.	Ai
	OpacityDrawing	layerName, opacity	Adjust opacity of a drawing.	Ai
	RemoveDrawing	layerName	Remove a drawing.	Ai
	RepositionDrawing	layerName, posX, posY	Reposition a drawing to desired x and y-axis position.	Ai
	ResizeDrawing	layerName, width, height	Resize a drawing to desired width and height.	Ai
	RotateDrawing	layerName, angle	Rotate a drawing to desired angle.	Ai
	StorkeDrawing	layerName, strokeWidth, red, green, blue	Adjust stroke of a drawing with desired width and RGB color.	Ai
Text	AlignText	layerName, alignment	Align text to desired alignment (left, center, right).	Ps Ai Id
	ApplyFont	layerName, fontName	Apply font to text.	Ps Ai Id
	ArrangeText	layerName, arrangement	Arrange text to desired arrangement (front, frontward, back, backward).	Ps Ai Id
	ColorText	layerName, red, green, blue	Color text to desired RGB color.	Ps Ai Id
	CreateText	layerName, textString	Create a new text (default to Arial font).	Ps Ai Id
	OpacityText	layerName, opacity	Adjust opacity of text.	Ps Ai
	RemoveText	layerName	Remove text.	Ps Ai Id
	RepositionText	layerName, posX, posY	Reposition text to desired x and y-axis position.	Ps Ai Id
	ResizeText	layerName, fontSize	Resize text to desired font size.	Ps Ai Id
	RotateText	layerName, angle	Rotate text to desired angle.	Ps Ai Id
	StrokeText	layerName, strokeWidth, red, green, blue	Adjust stroke of text with desired width and RGB color.	Ai Id
Object	ImportObject	fileName, layerName	Import an image or object from file path.	Ps Ai Id
	OpacityObject	fileName, opacity	Adjust opacity of an object.	Ps Ai
	RemoveObject	fileName	Remove an object.	Ps Ai Id
	RepositionObject	fileName, posX, posY	Reposition an object to desired x and y-axis position.	Ps Ai Id
	ResizeObject	fileName, width, height	Resize an object to desired width and height.	Ps Ai Id
	RotateObject	fileName, angle	Rotate an object to desired angle.	Ps Ai Id
	GenerateQRObject	layerName, linkURL	Generate a QR code with desired URL embedded.	Id
	AdjustBC	layerName, brightness, contrast	Adjust brightness and contrast level of an object.	Ps
	AdjustBW	layerName	Change an object to black & white.	Ps
	AdjustHSL	layerName	Adjust hue, saturation, and lightness level of an object.	Ps
	BlurObject	layerName, blurAmount	Blur an object to desired amount.	Ps
	PhotoFilter	layerName, filterType, density	Apply a photo filter to an object with desired density.	Ps
	GlassFilter	layerName, distortion, smoothness, scaling	Apply a glass filter to an object with the specified parameters.	Ps
	GlowFilter	layerName, graininess, glowAmount, clearAmount	Apply a glow filter to an object with the specified parameters.	Ps
	OceanRippleFilter	layerName, rippleSize, rippleMagnitude	Apply an ocean ripple filter to an object with the specified parameters.	Ps
	StainedGlassFilter	layerName, cellSize, borderThickness, lightIntensity	Apply a stained glass filter to an object with the specified parameters.	Ps
	PatchWorkFilter	layerName, squareSize, relief	Apply a patchwork filter to an object with the specified parameters.	Ps
	WatercolorFilter	layerName, brushDetail, shadowIntensity, texture	Apply a watercolor filter to an object with the specified parameters.	Ps

Table 6: Complete list of available tools in GraphicWeaver. Each tool requires specific parameters for execution. **Experts:** The expert agent(s) which supports the execution of a specific tool. For numerical parameters, we provide reference ranges (*e.g.,* `angle` as [0, 360], `brightness` as [-150, +150]). For parameters in filter-related functions, we provide a short description.

JavaScript for `AdjustBC` action (Photo Editor agent)

```
function promptForLayerName() {
    var layerName = arguments[0];

    if (layerName == null || layerName == "") {
        throw new Error("Layer with the name '" + layerName + "' does not exist.");
    }
    return layerName;
}

function promptForAdjustmentValues() {
    var brightness = parseInt(arguments[1], 10);
    var contrast = parseInt(arguments[2], 10);

    if (isNaN(brightness) || isNaN(contrast)) {
        throw new Error("Invalid input provided. Please run the script again and provide valid numbers.");
    }
    return { brightness: brightness, contrast: contrast };
}

function layerExists(layerName) {
    var ref = new ActionReference();
    ref.putName(charIDToTypeID("Lyr "), layerName);
    try {
        var desc = executeActionGet(ref);
        return true;
    } catch (e) {
        return false;
    }
}

function selectLayerByName(layerName) {
    var idselect = charIDToTypeID("slct");
    var desc = new ActionDescriptor();
    var idnull = charIDToTypeID("null");
    var ref = new ActionReference();
    var idLyr = charIDToTypeID("Lyr ");
    ref.putName(idLyr, layerName);
    desc.putReference(idnull, ref);
    var idMkVs = charIDToTypeID("MkVs");
    desc.putBoolean(idMkVs, false);
    executeAction(idselect, desc, DialogModes.NO);
}

function applyBrightnessContrastAdjustment(brightness, contrast) {
    var idBrtC = charIDToTypeID("BrgC");
    var desc = new ActionDescriptor();
    desc.putUnitDouble(charIDToTypeID("Brgh"), charIDToTypeID("#Prc"), brightness);
    desc.putUnitDouble(charIDToTypeID("Cntr"), charIDToTypeID("#Prc"), contrast);
    executeAction(idBrtC, desc, DialogModes.NO);
}

function adjustBrightnessContrast() {
    if (!layerExists(layerName)) {
        throw new Error("Layer with the name '" + layerName + "' does not exist.");
    }

    var layerName = promptForLayerName();
    if (layerName == null) {
        throw new Error("Layer name does not exist.");
    }

    var adjustments = promptForAdjustmentValues();
    if (adjustments == null) {
        throw new Error("Parameter values are not provided.");
    }

    selectLayerByName(layerName);
    applyBrightnessContrastAdjustment(adjustments.brightness, adjustments.contrast);
}

adjustBrightnessContrast();
```

Figure 4: JavaScript code snippet for `AdjustBC` for the Photo Editor agent. Each tool corresponds to an executable function in the design environment that takes predefined parameter values as input.

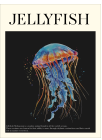
Category	Example User Query	Reference	Design	Env.
Book Cover	Create a book cover design for a romance novel titled 'Love \n Story' featuring a silhouette illustration of a couple in a romantic pose against a pink moonlit background. The title should be at the top center, the author's name 'A Novel By \n Olivia Wilson' below the title, and the tagline 'Best Selling Book of the Year' above the title, all in white.			Ps Id
Business Card	Create a one-sided business card design with a light yellow background for the bookstore'CACTUS'. Replace the 'T' in 'CACTUS' with a cactus-shaped illustration in green font, centered and add a tagline 'Livros Novos e Usados' in green font below the bookstore name.			Id
Postcard	Create a postcard design with the message 'Think Happy!' in a red, curly font on a floral background featuring a mix of warm-toned roses. Place a semi-transparent white box behind the message.			Ai Id
Poster	Create a poster design with a light yellow background, featuring a large jellyfish illustration centered within a black rectangular box. Add a bold, black title 'JELLYFISH' at the top and place a brief informative sentence about jellyfish in white font at the bottom left corner.			Ai Id

Table 7: Examples of human-annotated user queries, reference designs, and resulting design outcomes for each design category. Env.: Design environment(s) used for planning and execution.

Category	Example User Query	Example Questions
Book Cover	Please create a self-help book cover design titled 'Achieve Your Dreams' with the author's name 'Nathan White', featuring a person climbing a mountain centered in the lower half against a sunrise background. The title should be at the top center in white, the author's name below the title in white, and the tagline 'Climb Higher, Dream Bigger.' below the author's name in white.	["Is there a text 'Achieve Your Dreams'?", "Is there a text 'Nathan White'?", "Is there a person climbing a mountain?", "Is the background a sunrise?", "Is the text 'Achieve Your Dreams' at the top center in white?", "Is the text 'Nathan White' below the title in white?", "Is the text 'Climb Higher, Dream Bigger.' below the author's name in white?", "Is the person climbing a mountain centered in the lower half?"]
Business Card	I need to create a business card design for 'Sparkle Jewelry' with a royal blue background. Please include the company name in large gold font centered, and a medium-sized diamond icon placed above the company name. The contact details of 'Phone: +1 987 654 3210 \n Email: info@sparklejewelry.com \n Address: 12 Gem St, Los Angeles, CA, USA' should be in small gold font, placed bottom right.	["Is the background of the business card royal blue?", "Is the company name 'Sparkle Jewelry' in large gold font?", "Is the company name centered?", "Is there a medium-sized diamond icon?", "Is the diamond icon placed above the company name?", "Are the contact details in small gold font?", "Are the contact details placed at the bottom right?", "Is the phone number '+1 987 654 3210' included in the contact details?", "Is the email 'info@sparklejewelry.com' included in the contact details?", "Is the address '12 Gem St, Los Angeles, CA, USA' included in the contact details?"]
Postcard	Please create a motivational postcard design with the message 'Stay Positive, Work Hard' at the top in red on a yellow background featuring a large lion roaring at the bottom.	["Is there a text 'Stay Positive, Work Hard'?", "Is the text 'Stay Positive, Work Hard' at the top?", "Is the text 'Stay Positive, Work Hard' in red?", "Is the background yellow?", "Is there an illustration of a lion?", "Is the lion roaring?", "Is the lion illustration large?", "Is the lion illustration at the bottom?"]
Poster	Could you help create a promotional poster design for a jazz festival on a deep blue background, featuring a large image of a saxophonist playing in the center, a huge bold title 'JAZZFEST' in gold at the top center, and event details 'Jazz Festival | May 5-7, 2023 | Central Park, New York' in medium golden text at the bottom right?	["Is there a deep blue background?", "Is there a large image of a saxophonist playing in the center?", "Is there a huge bold title 'JAZZFEST'?", "Is the title 'JAZZFEST' in gold?", "Is the title 'JAZZFEST' at the top center?", "Is there event details 'Jazz Festival | May 5-7, 2023 | Central Park, New York'?", "Is the event details in medium golden text?", "Is the event details at the bottom right?"]

Table 8: Examples of the generated questions using GPT-4 for each design category. We use the questions to compute the VQA pass rate as part of execution evaluation.

User Query:

We need to create a business card design for a travel agency named 'Adventure Awaits' with a sky blue background. Please include the agency name in huge white font at the top center. I want to include the tagline 'Your Journey Begins Here' in medium white font below the agency name, and a mountain icon of medium size centered below the tagline. Also, add the contact details 'Phone: +1 800-555-7890 Email: info@adventureawaits.com Website: www.adventureawaits.com' in small white font at the bottom left.

Design Choices:

- **Background Color:** sky blue
- **Text:**
  - **Agency_name**
    - Content: "Adventure Awaits"
    - Size: large
    - Color: white
    - Position: top center
  - **Tagline**
    - Content: "Your Journey Begins Here"
    - Size: small
    - Color: white
    - Position: below the agency name
  - **Contact_details**
    - Content: "Phone: +1 800-555-7890 Email: info@adventureawaits.com Website: www.adventureawaits.com"
    - Size: small
    - Color: white
    - Position: bottom left
- **Images:**
  - **Mountain icon**
    - Size: medium
    - Position: center below the tagline

[Question 1]

Is each design choice **aligned** with the user query?

*(Here, **"aligned"** means that each design element fits the user's specifications in the query and contributes to the overall coherence of the final design.)*

	Not aligned at all (key elements are missing)	**Slightly aligned** (some important elements misplaced/incorrectly implemented)	**Moderately aligned** (capture general intent but need adjustment to fully meet user's specifications)	**Aligned well** (only need minor adjustments)	**Completely aligned** (perfectly match user query)
Background color	○	○	○	○	○
Agency_name	○	○	○	○	○
Tagline	○	○	○	○	○
Contact_details	○	○	○	○	○

[Question 2]

If you answered "Not aligned at all" or "Slightly aligned" to the previous question, please explain your reasoning in 1-2 sentences. You may also suggest changes to improve the alignment of the design choices with the user query.

Enter here

[Question 3]

Below are the three image candidates for **"mountain icon"**. Please rank them based on how well they fit the user query. Assign a rank from 1 (best fit) to 3 (least fit).

Image 1

Rank: Select rank

Image 2

Rank: Select rank

Image 3

Rank: Select rank

Figure 5: Screenshot of human annotation interface. For each user query, annotators are asked to (Q1) evaluate how well each design component aligns with the query on a five-point Likert scale and (Q2) rank the three images from 1 to 3 based on their relevance to the query. Additionally, they have the option to provide free-form feedback.

Model	Planning				Execution					
	Delivery Rate (%)	Design Pass Rate (%)	Step Eff.	Expert Use Eff.	Success Rate (%)	Fidelity	Content Similarity	VQA Pass Rate (%)	Creative (O)	Creative (E)
Direct mode (aggregated)										
QWEN-2.5-VL 7B	27.1	22.5	45.5	0.98	10.3	0.01	5.70	16.0	1.05	0.64
QWEN-2.5-VL 32B	57.2	19.7	55.9	**1.00**	17.5	0.04	6.62	19.0	1.18	1.07
GEMMA-3 12B	37.7	19.0	63.8	0.99	14.9	0.03	6.93	13.6	1.18	0.76
GEMMA-3 27B	**67.8**	24.8	70.9	**1.00**	22.3	0.09	9.36	17.7	1.09	1.09
GPT-O4-MINI	46.2	23.3	79.5	**1.00**	27.9	0.10	8.72	21.5	1.14	1.12
GPT-4.1	30.3	**30.1**	**82.5**	**1.00**	**29.5**	**0.13**	**13.1**	**23.3**	**1.39**	**1.35**
Book Cover										
QWEN-2.5-VL 7B	9.34	25.5	38.3	0.98	3.5	0.00	5.72	21.6	1.15	0.64
QWEN-2.5-VL 32B	52.8	21.1	65.1	**1.00**	16.8	0.00	5.12	**24.8**	**1.44**	1.02
GEMMA-3 12B	23.8	20.0	66.5	**1.00**	14.4	0.09	7.08	14.5	1.18	0.97
GEMMA-3 27B	**68.9**	25.5	75.7	**1.00**	25.9	0.09	9.50	19.9	1.06	**1.32**
GPT-O4-MINI	45.6	23.1	**81.4**	**1.00**	27.4	0.09	10.4	20.7	1.08	1.09
GPT-4.1	30.5	**28.1**	80.3	**1.00**	**29.9**	**0.12**	**14.2**	21.8	1.25	**1.32**
Business Card										
QWEN-2.5-VL 7B	18.7	**27.4**	44.5	0.97	10.3	0.00	5.00	15.7	0.98	0.77
QWEN-2.5-VL 32B	30.6	16.1	46.3	**1.00**	12.5	0.00	4.67	16.2	1.02	0.94
GEMMA-3 12B	20.9	15.6	68.4	0.98	12.9	0.00	5.72	11.8	1.05	0.64
GEMMA-3 27B	**45.6**	19.3	65.4	**1.00**	22.8	0.05	7.45	15.6	1.07	0.97
GPT-O4-MINI	37.8	21.1	74.5	**1.00**	24.4	0.10	7.75	19.3	1.04	0.97
GPT-4.1	18.9	25.7	**81.4**	**1.00**	**26.1**	**0.12**	**11.1**	**21.0**	**1.43**	**1.09**
Postcard										
QWEN-2.5-VL 7B	45.6	21.9	55.8	0.98	15.3	0.01	6.95	14.5	0.96	0.43
QWEN-2.5-VL 32B	66.7	23.4	55.6	**1.00**	18.9	0.08	8.01	19.4	1.13	1.23
GEMMA-3 12B	72.4	21.0	61.1	**1.00**	16.9	0.03	7.33	15.6	1.25	0.77
GEMMA-3 27B	**82.1**	27.9	70.9	**1.00**	19.2	0.11	9.58	17.8	1.09	0.93
GPT-O4-MINI	40.6	23.8	82.2	**1.00**	**31.0**	0.11	8.51	23.4	1.18	1.12
GPT-4.1	20.7	**34.3**	**83.5**	**1.00**	30.9	**0.14**	**13.8**	**24.6**	**1.57**	**1.47**
Poster										
QWEN-2.5-VL 7B	34.9	15.2	43.2	**1.00**	12.0	0.02	5.12	12.2	1.12	0.71
QWEN-2.5-VL 32B	**78.9**	18.3	56.8	**1.00**	21.7	0.09	8.66	15.6	1.11	1.08
GEMMA-3 12B	33.6	19.4	59.2	**1.00**	15.5	0.02	7.58	12.6	1.25	0.67
GEMMA-3 27B	74.5	26.3	71.4	**1.00**	21.3	0.11	10.9	17.4	1.15	1.16
GPT-O4-MINI	60.7	25.3	80.0	**1.00**	29.0	0.12	8.21	22.6	1.24	1.32
GPT-4.1	51.1	**32.3**	**84.7**	**1.00**	**31.2**	**0.13**	**13.3**	**25.7**	**1.32**	**1.54**

Table 9: Planning and execution results of different VLMs on GraphicWeaver for direct mode (aggregated and per category). For each section, column-wise best scores are **bolded** and second-best scores are underlined. All metrics are interpreted as higher values for better performance (↑).

Model	Planning				Execution					
	Delivery Rate (%)	Design Pass Rate (%)	Step Eff.	Expert Use Eff.	Success Rate (%)	Fidelity	Content Similarity	VQA Pass Rate (%)	Creative (O)	Creative (E)
Agentic mode (aggregated)										
QWEN-2.5-VL 7B	15.2	51.8	92.0	**1.00**	39.4	0.14	22.5	37.6	1.77	1.59
QWEN-2.5-VL 32B	39.6	49.7	92.4	**1.00**	61.3	0.20	22.3	35.4	1.89	1.65
GEMMA-3 12B	27.3	54.5	96.5	**1.00**	58.1	0.17	21.0	36.2	2.01	1.68
GEMMA-3 27B	**51.4**	54.4	93.1	**1.00**	55.4	0.20	26.7	44.7	1.98	2.04
GPT-O4-MINI	20.8	51.1	**97.1**	**1.00**	56.5	0.20	28.3	**44.8**	1.78	1.99
GPT-4.1	13.9	**56.8**	94.7	**1.00**	**62.5**	**0.21**	**29.3**	44.7	**2.02**	**2.06**
Book Cover										
QWEN-2.5-VL 7B	6.40	52.4	92.6	**1.00**	10.6	0.10	17.2	37.9	1.75	1.57
QWEN-2.5-VL 32B	40.0	56.1	95.4	**1.00**	66.0	0.18	17.4	34.1	1.99	1.73
GEMMA-3 12B	17.5	55.9	**97.2**	**1.00**	60.8	0.17	18.3	33.0	**2.22**	1.99
GEMMA-3 27B	**57.4**	53.6	90.7	**1.00**	53.5	0.19	23.6	**46.4**	2.07	**2.14**
GPT-O4-MINI	23.9	48.9	97.0	**1.00**	55.0	0.18	**27.3**	41.0	1.91	1.96
GPT-4.1	4.90	**56.9**	95.4	**1.00**	**66.4**	**0.22**	24.0	38.3	2.00	2.07
Business Card										
QWEN-2.5-VL 7B	12.3	48.8	94.3	**1.00**	56.0	0.12	19.4	30.7	1.61	1.53
QWEN-2.5-VL 32B	**46.8**	44.2	90.5	**1.00**	**62.1**	**0.20**	18.5	29.8	1.73	1.64
GEMMA-3 12B	1.70	53.3	96.5	**1.00**	58.1	0.15	19.2	34.5	1.81	1.64
GEMMA-3 27B	9.60	53.4	94.4	**1.00**	54.6	0.16	24.8	39.2	1.91	1.98
GPT-O4-MINI	2.60	51.2	**97.0**	**1.00**	56.1	0.19	**32.1**	**47.7**	1.85	1.79
GPT-4.1	0.00	**55.8**	93.8	**1.00**	60.7	**0.20**	27.8	46.9	**2.12**	**2.03**
Postcard										
QWEN-2.5-VL 7B	21.2	53.6	91.0	**1.00**	48.9	0.18	30.9	48.7	1.98	1.91
QWEN-2.5-VL 32B	61.1	43.1	90.9	**1.00**	**62.8**	0.21	31.0	46.9	2.06	1.75
GEMMA-3 12B	68.0	55.2	94.4	**1.00**	56.4	0.18	23.3	40.1	2.13	1.73
GEMMA-3 27B	**82.3**	54.8	95.4	**1.00**	59.5	**0.22**	31.2	**50.2**	2.14	2.20
GPT-O4-MINI	15.4	50.3	**96.8**	**1.00**	53.6	0.20	28.3	45.0	1.70	2.18
GPT-4.1	8.00	**56.5**	94.2	**1.00**	57.5	0.21	**33.6**	48.4	**2.20**	**2.22**
Poster										
QWEN-2.5-VL 7B	20.9	52.4	90.0	**1.00**	42.2	0.18	22.5	33.3	1.75	1.37
QWEN-2.5-VL 32B	10.6	55.4	92.9	**1.00**	54.3	0.19	22.1	30.9	1.77	1.47
GEMMA-3 12B	21.9	53.6	**97.9**	**1.00**	57.2	0.18	23.2	37.3	**1.88**	1.37
GEMMA-3 27B	**56.1**	55.6	91.7	**1.00**	53.9	0.21	27.0	43.1	1.79	1.85
GPT-O4-MINI	41.4	53.9	97.5	**1.00**	61.3	0.21	25.5	**45.6**	1.67	**2.04**
GPT-4.1	42.7	**57.9**	95.4	**1.00**	**65.3**	**0.22**	**31.8**	45.3	1.75	1.91

Table 10: Planning and execution results of different VLMs on GraphicWeaver for agentic mode (aggregated and per category). For each section, column-wise best scores are **bolded** and second-best scores are underlined. All metrics are interpreted as higher values for better performance (↑).

Model	Frequency	Tool-Use Sequence
QWEN-2.5-VL 7B	34	CreateDocumentCustom → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → CreateText → ApplyFont → ColorText → AlignText → ResizeText → RepositionText → ExportDocument → AdjustHSL → SaveDocument
	22	CreateDocumentCustom → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → AdjustHSL → SaveDocument → CreateText → ApplyFont → ColorText → AlignText → ResizeText → ExportDocument
	17	CreateDocumentCustom → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → AdjustHSL → SaveDocument → CreateText → ResizeText → ColorText → AlignText → RepositionText → ExportDocument
QWEN-2.5-VL 32B	45	CreateDocumentCustom → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → SaveDocument → CreateText → ApplyFont → ColorText → AlignText → ExportDocument
	22	CreateDocumentCustom → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → SaveDocument → CreateText → ApplyFont → ColorText → AlignText → RepositionText → ExportDocument
	12	CreateDocumentCustom → SetBackgroundColor → CreateText → ColorText → AlignText → ImportObject → ResizeObject → RepositionObject → ExportDocument
GEMMA-3 12B	28	CreateDocumentCustom → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → SaveDocument → CreateText → ResizeText → ColorText → AlignText → RepositionText → ExportDocument
	26	CreateDocumentCustom → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → SaveDocument → CreateText → ResizeText → ColorText → AlignText → ExportDocument
	14	CreateDocumentCustom → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → CreateText → ApplyFont → ColorText → AlignText → ResizeText → ExportDocument → AdjustHSL → SaveDocument
GEMMA-3 27B	59	CreateDocumentCustom → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → CreateText → ColorText → AlignText → ExportDocument
	48	CreateDocumentCustom → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → CreateText → ResizeText → ColorText → AlignText → ExportDocument
	44	CreateDocumentCustom → ImportObject → ResizeObject → RepositionObject → SaveDocument → SetBackgroundColor → CreateText → ApplyFont → ColorText → AlignText → ExportDocument
GPT-O4-MINI	78	CreateDocument → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → AdjustHSL → SaveDocument → CreateText → ColorText → AlignText → ExportDocument
	53	CreateDocumentCustom → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → AdjustHSL → SaveDocument → CreateDocument → CreateText → ColorText → AlignText → ExportDocument
	42	CreateDocumentCustom → SetBackgroundColor → CreateText → ColorText → AlignText → ImportObject → ResizeObject → RepositionObject → ExportDocument
GPT-4.1	37	CreateDocumentCustom → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → CreateText → ColorText → AlignText → ExportDocument
	33	CreateDocumentCustom → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → CreateText → ResizeText → ColorText → AlignText → ExportDocument
	21	CreateDocument → SetBackgroundColor → ImportObject → ResizeObject → RepositionObject → AdjustHSL → SaveDocument → CreateText → AlignText → ExportDocument

Table 11: Top-3 most common tool-use sequences per model, ordered by frequency.

D Prompts

D.1 GraphicWeaver Prompts

We show prompt templates used for constructing user queries in GraphicWeaver and prompting VLMs for in the agentic mode below.

Prompt D.1.1: Query Construction (Book Cover)

Task: You are a design expert. Given the template for generating a book cover, fill in the placeholders with appropriate design components. Generate 5 diverse examples in a Python list of strings. Be as creative as possible.

Template: Create a book cover design with a [background color] background, featuring [images]. The title [title] should be placed at [position] in [color] and the author name [author name] at [position] in [color].
You may also include an optional [subtitle] or [tagline] if needed.

**** Example Starts ***
Create a book cover design for a romance novel titled 'Love \n Story' featuring a silhouette illustration of a couple in a romantic pose against a pink moonlit background. The title should be at the top center, the author's name 'A Novel By \n Olivia Wilson' below the title, and the tagline 'Best Selling Book of the Year' above the title, all in white.
**** Example Ends ***

Examples:

Prompt D.1.2: Query Construction (Business Card)

Task: You are a design expert. Given the template for generating a business card, fill in the placeholders with appropriate design components. Generate 5 diverse examples in a Python list of strings. Be as creative as possible.

Template: Create a [side]-sided business card design with a [background color] background, featuring [images]. The name [brand name] should be placed at [position] in [color].
You may also include an optional [contact details] or [tagline] if needed.

**** Example Starts ***
Create a one-sided business card design with a light yellow background for the bookstore'CACTUS'. Replace the 'T' in 'CACTUS' with a cactus-shaped illustration in green font, centered and add a tagline 'Livros Novos e Usados' in green font below the bookstore name.
**** Example Ends ***

Examples:

Prompt D.1.3: Query Construction (Postcard)

Task: You are a design expert. Given the template for generating a postcard, fill in the placeholders with appropriate design components. Generate 5 diverse examples in a Python list of strings. Be as creative as possible.

Template: Create a postcard design with a [background color] background, featuring [images]. The message [message] should be placed at [position] in [color].

**** Example Starts ***
Create a postcard design with the message 'Think Happy!' in a red, curly font on a floral background featuring a mix of warm-toned roses. Place a semi-transparent white box behind the message.
**** Example Ends ***

Examples:

Prompt D.1.4: Query Construction (Poster)

Task: You are a design expert. Given the template for generating a poster, fill in the placeholders with appropriate design components. Generate 5 diverse examples in a Python list of strings. Be as creative as possible.

Template: Create a poster design with a [background color] background, featuring [images]. The title [title] should be placed at [position] in [color].
You may also include an optional [tagline] if needed.

**** Example Starts ***
Create a poster design with a light yellow background, featuring a large jellyfish illustration centered within a black rectangular box. Add a bold, black title 'JELLYFISH' at the top and place a brief informative sentence about jellyfish in white font at the bottom left corner.
**** Example Ends ***

Examples:

Prompt D.1.5: Expert Agent Recruitment

Task: Your task is to recruit the necessary experts to complete a design outlined in the user query. Create a recruitment status in JSON list format.

User query: `{user query}`
User image file(s): `{user image files}`

You can recruit from the three experts with the following profiles:

- **Photo Editor**
  - Job Responsibilities:
    - Image editing: Cropping, adjusting composition, correcting lighting, and retouching images or illustrations.
    - Color correction: Adjusting brightness and contrast or adjusting hue and saturation.
    - Apply filters: Apply different filters (e.g., photo, glass, ocean ripple, watercolor) to images.
- **Vector Graphic Editor**
  - Job Responsibilities:
    - Draw shapes: Drawing simple shapes (circle, polygon, square, star) on canvas.
- **Layout Designer**
  - Job Responsibilities:
    - Customize layout templates: Create grid systems for books, brochures, cards, and magazines to organize the layout.
    - Export files: Export documents to any format, in print or digital.
    - Combine text and visual elements: Combine visual elements from other apps with text into a completed design.

*** Output Format ***
Each object in the JSON list should follow:
```
{
    "expert": "Name of the expert (Photo Editor, Vector Graphic Editor, Layout
        Desinger).",
    "task": "High-level task that can be performed by the expert."
}
```
*** Example Starts ***
```
[
    {"expert": "Photo Editor", "task": "Add the provided images to create a deep
         purple night sky background with a large dreamy moon centered,
        surrounded by small twinkling stars spread across the top half of the
        cover."},
    {"expert": "Layout Designer", "task": "Combine the edited image with the
        title 'Moonlit Fantasies', the author name 'J.K. Stellar', and the
        tagline 'A Journey Through the Night Sky.' to create the book cover
        design."}
]
```
*** Example Ends ***

**** Key Requirements ***
- Only recruit each expert one.
- The name of the expert must match those in the expert profiles.
- For task description, explain how the expert can contribute towards the final product. Summarize in one sentence.
- In order to achieve the task in the design outline, experts should work together and their task will be dependent to each other. Arrange in the order of which expert should finish first.
- Output should be in a list of JSON objects format.
- Do NOT include further explanation other than in the JSON list.
- Be as concise and brief as possible.

Recruitment status:

Prompt D.1.6: Individual Plan Generation

Task: You are a proficient `{expert}`. You are recruited to collaborate on a design project with other experts.

You are assigned to complete the following task: `{task}`. Please plan a sequence of detailed, low-level subtasks required to accomplish this task and output them as a JSON list.

**** Output Format ***
Each object in the JSON list should follow:

```
{
    "id": "ID of the subtask, starting from 1.",
    "expert": "Name of the expert.",
    "description": "Description of the subtask in one sentence."
}
```

*** Example Starts ***

```
[
    {"id": 1, "expert": "Photo Editor", "description": "Create a new document
        with book cover dimensions."},
    {"id": 2, "expert": "Photo Editor", "description": "Set the background color
         to light pink."},
    {"id": 3, "expert": "Photo Editor", "description": "Import the pink moonlit
        image from 'static/pink_moonlit.png'."},
    {"id": 4, "expert": "Photo Editor", "description": "Resize the pink moonlit
        image to medium size, covering the bottom part of the document."},
    {"id": 5, "expert": "Photo Editor", "description": "Reposition the pink
        moonlit image to the bottom-center of the document."},
    {"id": 6, "expert": "Photo Editor", "description": "Import the couple
        silhouette illustration from 'static/couple_silhouette.png'."},
    {"id": 7, "expert": "Photo Editor", "description": "Resize the couple
        silhouette illustration to span across the lower half of the cover."},
    {"id": 8, "expert": "Photo Editor", "description": "Reposition the couple
        silhouette illustration to be centered in the bottom-middle part."},
    {"id": 9, "expert": "Photo Editor", "description": "Adjust the background
        colors to match the light pink moonlit theme."},
    {"id": 10, "expert": "Photo Editor", "description": "Save the document in a
        psd format suitable for further editing by the Layout Designer."},
]
```

*** Example Ends ***

**** Key Requirements ***
- First step should always be creating a new document and the last step should always be saving the document in appropriate file format.
- Use the exact image URLs the user provided when importing images.
- Do not include very basic operations such as opening the software or closing the software.
- Do not include new expert in the plan.
- Output should be in a list of JSON objects format.
- Do NOT include further explanation other than in the JSON list.
- Be as concise and brief as possible.

Sequence of subtasks:

Prompt D.1.7: Plan Supervision

Task: You are the supervisor of a design project that requires collaboration among various design experts.

The following experts have been recruited for the project. Use as reference:
`{recruitment status}`

Each expert has submitted their proposed workflow plans:
`{workflow plans}`

Your task is to combine these proposed workflow plans into a cohesive sequence of tasks in a JSON list format.

**** Output Format ***
Each object in the JSON list should follow:

```
{
    "id": "ID of the subtask, starting from 1.",
    "expert": "Name of the expert.",
    "description": "Description of the subtask in one sentence."
}
```

*** Example Starts ***

```
[
    {"id": 1, "expert": "Photo Editor", "description": "Create a new document
        with book cover dimensions."},
    {"id": 2, "expert": "Photo Editor", "description": "Set the background color
         to light pink."},
    ...
    {"id": 11, "expert": "Layout Designer", "description": "Create a new
        document with book cover dimensions."},
    {"id": 12, "expert": "Layout Designer", "description": "Import the edited
        image from the Photo Editor: 'moonlit_illustration_edited.psd'."},
    {"id": 13, "expert": "Layout Designer", "description": "Resize the edited
        image to cover the entire document."},
    {"id": 14, "expert": "Layout Designer", "description": "Create text for the
        title 'LOVE\nSTORY'."},
    {"id": 15, "expert": "Layout Designer", "description": "Apply the Andale
        Mono font to the title text."},
    ...
    {"id": 31, "expert": "Layout Designer", "description": "Reposition the
        tagline text above the title."},
    {"id": 32, "expert": "Layout Designer", "description": "Export the final
        book cover design as a PDF file."}
]
```

*** Example Ends ***

**** Key Requirements ***
- Do NOT repeat any steps that are already completed in previous step.
- For each expert, first step should always be creating a new document and the last step should always be saving the document in appropriate file format.
- When switching experts, use the output from the previous expert as input for the next.
- Once an expert is used and switched to another expert, it should not be used again.
- You should output only one list of workflow plan.
- Start the id from 1 to the number of steps in the workflow.
- Arrange each subtask in a chronological order.
- Output should be in a list of JSON objects format.
- Do NOT include further explanation other than in the JSON list.
- Be as concise and brief as possible.

Supervised sequence of subtasks:

Prompt D.1.8: Tool Retrieval

Task: You are a proficient `{expert}`. You are recruited to collaborate on a design project with other experts. Use your available list of tools to map each step in the sequence of subtasks to a tool.

Sequence of subtasks: `{workflow plan}`

Your available tools are as below:
`{list of tools}`

**** Output Format ***
Each object in the JSON list should follow:

```
{
    "id": "ID of the subtask, starting from 1.",
    "expert": "Name of the expert.",
    "description": "Description of the subtask in one sentence.",
    "tool": "Name of the mapped tool.",
    "parameters": "Dictionary of parameter keys and corresponding values."
}
```

*** Example Starts ***

```
[
    {"id": 1, "expert": "Photo Editor", "description": "Create a new document
        with book cover dimensions.", "skill": "CreateDocument", "parameters":
        {"docType": "book cover"}},
    {"id": 2, "expert": "Photo Editor", "description": "Set the background color
         to light pink.", "skill": "SetBackgroundColor", "parameters": {"red":
        255, "green": 179, "blue": 238}},
    ...
    {"id": 8, "expert": "Photo Editor", "description": "Reposition the couple
        silhouette illustration to be centered in the bottom-middle part.", "
        parameters": {"layerName": "SilhouetteLayer", "posX": 267, "posY":
        1052}},
    {"id": 9, "expert": "Photo Editor", "description": "Adjust the background
        colors to match the light pink moonlit theme.", "skill": "AdjustHSL", "
        parameters": {"layerName": "MoonlitLayer", "hue": 18, "saturation": -18,
         "light": 0}},
    {"id": 10, "expert": "Photo Editor", "description": "Save the document in a
        format suitable for further editing by the Layout Designer.", "skill": "
        SaveDocument", "parameters": {"fileName": "moonlit_illustration_edited",
         "format": "psd"}},
]
```

*** Example Ends ***

**** Key Requirements ***
- For any file name that appears in the design outline, use exact file names in your sequence of subtasks.
- Each step should only be mapped to one tool. If a step of the workflow is not able to be mapped to one tool, it means the step can be decomposed further into multiple steps. You can reformat, reorder, add, edit steps of the workflow if needed to be directly mapped to tools.
- Each step should have a tool and a dictionary of parameter values.
- For layerName, try to name it as to end as Layer (e.g., BackgroundLayer, TitleLayer).
- For detailed numeric values (e.g., height, width, x-axis position, y-axis position), consider the document's dimensions, imagine, and propose a likely value.
- Arrange each subtask in a chronological order.
- Output should be in a list of JSON objects format.
- Do NOT include further explanation other than in the JSON list.
- Be as concise and brief as possible.

Sequence of subtasks:

D.2 Evaluation Prompts

We present the prompts used for evaluating both planning and execution, including design pass rate (color, text, image), VQA pass rate, and creativity (originality and elaboration).

Prompt D.2.1: Design Pass Rate Evaluation (Color)

Task: Evaluate if the workflow plan (1) correctly applies the background color and (2) the background and the text color are contrasting. Return a score between 1 to 5 according to the scoring rubric.

Background color: `{background color}`
Text elements: `{text}`
Workflow plan: `{workflow plan}`

**** Scoring Rubric ***
- 1: Workflow plan fails to reflect all of the color constraints specified.
- 3: Workflow plan reflects approximately half of the color constraints specified.
- 5: Workflow plan reflects all of the color constraints specified.

Score should strictly be a number between 1 to 5. Do not include any further explanation other than the score.
Score:

Prompt D.2.2: Design Pass Rate Evaluation (Text)

Task: Evaluate if the workflow plan adequately applies the text elements (e.g., title, tagline) specified. Return a score between 1 to 5 according to the scoring rubric.

Text elements: `{text}`
Workflow plan: `{workflow plan}`

**** Scoring Rubric ***
- 1: Workflow plan fails to reflect all of the text elements specified.
- 3: Workflow plan reflects approximately half of the text elements specified.
- 5: Workflow plan reflects all of the text elements specified.

Score should strictly be a number between 1 to 5. Do not include any further explanation other than the score.
Score:

Prompt D.2.3: Design Pass Rate Evaluation (Image)

Task: Evaluate if the workflow plan adequately applies the image elements (e.g., size, position) specified. Return a score between 1 to 5 according to the scoring rubric.

Image elements: `{image}`
Workflow plan: `{workflow plan}`

**** Scoring Rubric ***
- 1: Workflow plan fails to reflect all of the image elements specified.
- 3: Workflow plan reflects approximately half of the image elements specified.
- 5: Workflow plan reflects all of the image elements specified.

Score should strictly be a number between 1 to 5. Do not include any further explanation other than the score.
Score:

Prompt D.2.4: VQA Evaluation

Instruction: Look at the image and answer the question with 'Yes' or 'No'.

Question: `{quetion}`
Answer:

Prompt D.2.5: Creativity Evaluation (Originality)

Instruction: Evaluate the originality of the image generated based on the user query. Originality measures the uniqueness of the ideas generated. Original ideas are those that are rare or unconventional, differing from the norm. Return a score between 1 to 5 according to the scoring rubric.

User query: `{user query}`

**** Scoring Rubric ***
- 1: Image is highly conventional and predictable. No significant signs of creative thinking is shown.
- 2: Image shows minimal originality and mostly align with typical or common responses. Few novel elements are present.
- 3: Image is somewhat original, with a mix of conventional and unique elements.
- 4: Image is noticeable original and uncommon. It shows creative thinking and depart meaningfully from conventional norms.
- 5: Image is highly unique, rare, and stand out as unconventional. They demonstrate a strong departure from typical or expected approaches.

Score should strictly be a number between 1 to 5. Do not include any further explanation other than the score.
Score:

Prompt D.2.6: Creativity Evaluation (Elaboration)

Instruction: Evaluate the elaboration of the image generated based on the user query. Elaboration refers to the ability to expand upon, refine, and embellish an idea. It involves adding details, developing nuances, and building upon a basic concept to make it more intricate or complex. Return a score between 1 to 5 according to the scoring rubric.

User query: `{user query}`

**** Scoring Rubric ***
- 1: Image is presented in a simpler or vague manner with no meaningful development or supporting detail.
- 2: Image is minimally expanded, with few details or refinements added.
- 3: Image includes expansion of some details, but elaboration is somewhat surface-level.
- 4: Image well-expands the user query with several added details and refinements.
- 5: Image thoroughly expands the user query with rich, specific details or refinements added beyond the core concept.

Score should strictly be a number between 1 to 5. Do not include any further explanation other than the score.
Score: