
Supplemental Material for MMMG: A Massive, Multidisciplinary, Multi-Tier Generation Benchmark for Text-to-Image Reasoning

Yuxuan Luo^{1†}, Yuhui Yuan^{4‡}, Junwen Chen^{2†}, Haonan Cai¹, Ziyi Yue¹,
Yuwei Yang^{3†}, Fatima Zohra Doha⁵, Ji Li⁵, Zhouhui Lian^{1‡}
¹Wangxuan Institute of Computer Technology, Peking University, China,
²The University of Electro-Communications, ³Australian National University
⁴Microsoft Research Asia, ⁵Microsoft
<https://mmmgbench.github.io/>

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[†]Research interns at Microsoft. [‡]: yuhui.yuan@microsoft.com lian Zhouhui@pku.edu.cn

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A Detailed Data Statistics

We report statistics for the MMMG benchmark (Table 1) and the training set (Table 2). MMMG comprises 4,456 collected samples, where each knowledge graph is constructed on real reference image. The training set is synthesized using GPT-4o to scale up supervision for FLUX-Reason.

Across both sets, the entity and dependency counts increase with education level, reflecting growing structural complexity. Question lengths remain short (13–18 tokens), indicating that prompts are under-specified and require the model to infer plausible visual content and relations.

Table 1: Distribution of 4,456 MMMG Benchmark Data Across Education Levels.

	Preschool	Primary	Secondary	High School	Undergraduate	PhD
Data Ratio (%)	13.26	14.36	14.65	14.27	15.21	15.56
Avg. Question Tokens	13.38	16.69	16.99	17.55	16.92	17.01
Avg. Entities	5.91	6.44	7.18	7.38	8.51	8.53
Avg. Dependencies	4.09	5.26	6.20	6.64	7.97	7.88

Table 2: Distribution of 16,000 Training Samples Across Education Levels.

	Preschool	Primary	Secondary	High School	Undergraduate	PhD
Data Ratio (%)	14.72	17.55	17.85	23.64	13.53	12.71
Avg. Question Tokens	17.18	16.69	16.99	17.55	16.92	17.01
Avg. Entities	5.18	5.91	6.34	6.69	7.20	8.14
Avg. Dependencies	4.56	5.27	5.67	6.16	6.57	7.80

B Human Evaluation Details

We built an HTML-based annotation interface (Figure 1) to gather expert evaluations of knowledge images. Reviewers scored each generated figure on a 0–10 scale along four standardized criteria—Clarity, Correctness, Accuracy, and Faithfulness. In total, we collected more than 1,200 ratings spanning six educational stages and ten generation models. These human judgments underpin the analysis in Section 4.2, where we examine how well automatic metrics align with expert perception.

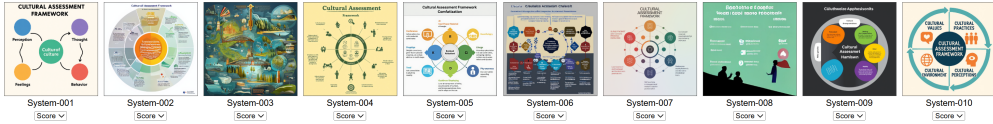
Expert Scoring Guidelines (0–10)

1. **Clarity** – visual/text elements are sharp, legible, uncropped.
2. **Correctness** – graphical conventions (axes, legends, labels) are valid and match the intended content.
3. **Accuracy** – numeric values, units and annotations are error-free and internally consistent.
4. **Faithfulness** – the image faithfully conveys the underlying knowledge rather than surface aesthetics.

0 = unacceptable, 10 = perfect. Skip if unsure.

Live JSON of your scores

3_highschool_Sociology_0



3_highschool_Sociology_10

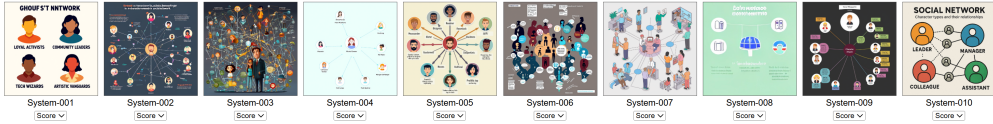


Figure 1: Expert scoring interface. Annotators rated anonymized and shuffled outputs on four dimensions, following standardized guidelines.

C Prompts

Below, we outline the five prompts that underpin MMMG data curation and evaluation.

C.1 Question-Generation Prompt

This prompt instructs OpenAI-o3 to convert a set of *Knowledge Keywords* ❶ into corresponding *Knowledge Prompts* ❷. Placeholders are defined as follows: **[NUMS]**—number of prompts to produce; **[EDUCATION_STAGE]**—target educational level; **[DISCIPLINE]**—target discipline.

Question Generation Prompt

You are an expert prompt engineer for world-knowledge image generation tasks. Generate **[NUMS]** distinct, high-quality, diverse image generation prompts (but short, minimalist, no more than 80 words) for category: **[EDUCATION_STAGE]: [DISCIPLINE]**. Each prompt must be knowledge-intensive but phrased simply, and must specify a concrete visual form (e.g., diagram, infographic, educational poster, risograph, PDF render). Each prompt should:

- Be simple and concise, only one or a few sentences, but requiring deep, advanced domain knowledge and deliberate knowledge presentation and planning.
- Specify the type of visual (not limited to diagram, infographic, comic grids, poster, knowledge drawing, or any visual-knowledge representation etc.).
- Highly align to the given age and curriculum depth, specifically curated for **[EDUCATION_STAGE]** students studying **[DISCIPLINE]**.

The output must follow the format: ‘
PROMPT: **[YOUR_PROMPT]**.

C.2 Data-Filter Prompt

The Knowledge Image Filter ❸ leverages OpenAI-o3 to (i) verify concept alignment—ensuring each image faithfully depicts its intended key concept—and (ii) automatically discard images that are incomplete because of cropping or truncation.

Data Filter prompt: consistency & alignment / truncation

You are a strict image-data filter. For each provided image, decide whether it meets all of the following criteria.

If it does, set "judge": true; otherwise set "judge": false.

In either case, provide a "reason" list explaining your decision.

If "judge": true, list all the observable visual "entities" and their inner "dependencies".

Criteria:

1. **Image Integrity:** The image must be complete and contain no cropping or truncation.
2. **Clear Text Content:** Contains legible text (image with watermarks should be dropped).
3. **Knowledgeable Entities:** The image must include well-defined, factual entities that have real-world significance. These entities can include both visual elements and text.
4. **Explicit Dependency Relationships:** The entities in the image should exhibit one or more of the following dependency relationships: $\text{Defines}(e_1, e_2)$, $\text{Entails}(e_1, e_2)$, $\text{Causes}(e_1, e_2)$, $\text{Contains}(e_1, e_2)$, $\text{Requires}(e_1, e_2)$, $\text{TemporalOrder}(e_1, e_2)$.
5. **Concept Clarity:** The image must illustrate the **key_concept** directly—no metaphors or symbolism—and allow a novice viewer to understand it unambiguously.
7. **Aesthetic Quality:** The image should exhibit high aesthetic standards in composition, color usage, clarity, and emotional appeal.
8. **Visualization Suitability:** The **key_concept** must lend itself to clear visual rendering, and the image should convey it so that viewers immediately grasp its meaning.

Your output must **strictly follow** the format:

```
{
  "judge": true | false,
  "reason": [reason]
  "elements": [
    "[ELEMENT_1]",
    "[ELEMENT_2]",
    "... (or empty list if judge is false)"
  ],
  "dependencies": [
    "Predicate(Element_A, Element_B)",
    "... (or empty list if judge is false)"
  ],
}
```

Here is the provided **Key Concept**: **[KEY_CONCEPT]**

C.3 Knowledge Graph Generation Prompt

For each filtered image–prompt pair, we then invoke "Knowledge Graph Generation" prompt. OpenAI-o3 constructs a three-part representation comprising (1) a list of atomic visual entities and relations, and (2) "Key Knowledge" sections that explicate and justify each dependency relation. This structured

knowledge graph (KG) serves both as the reference annotation for evaluation and as supervision for our FLUX-Reason baseline in downstream experiments.

Knowledge Graph Generation Prompt

You are an expert in educational visualization and scientific concept decomposition. Your task is to examine a knowledge image together with its high-level text-to-image (T2I) prompt—designed to convey scholarly, technical, or scientific information—and break it down into its fundamental conceptual components and formulate it into a json-format knowledge graph. You should structure your output into **three dimensions**:

1. Visual Components (i.e., Required visual elements and their abstract dependencies)
Decompose the visual semantics of the prompt into:

- Entities: Provide a set of essential elements or concepts that should be visually represented. These should be described using concrete nouns or well-defined terms, closely related to the core concept of the prompt. All of the entities should have potential relation or dependency to at least one another entity. Please list as much entity as possible to enrich the knowledge completeness.
- Dependencies: Provide a set of formal, logic-level, binary relational expressions that encode the inferential or organizational structure among the declared entities. **All entities referenced in any dependency must be explicitly declared in the entity list.** Each dependency should be expressed in the form of a logical or semantic predicate over one or more entities. For example:
 - > Let $E = \{e_1, e_2, \dots, e_n\}$ be the set of entities;
 - > Then $D = \{R_i(e_j, e_k)\}$, where R_i is a binary relation such as:
 - Defines(e_1, e_2): Use to indicate that e_2 serves as the formal definition or meaning basis for e_1 .
 - Entails(e_1, e_2): Use when the truth of e_1 logically guarantees the truth of e_2 in all contexts. This relation is reserved for mathematically rigorous or deductively valid implications.
 - Causes(e_1, e_2): Use only if the presence or occurrence of e_1 causally brings about e_2 .
 - Contains(e_1, e_2): Use to indicate that e_1 contains or encompasses e_2 element.
 - Requires(e_1, e_2): e_1 requires or depends on e_2 . Make sure the causal direction is not reversed.
 - TemporalOrder(e_1, e_2): Use to indicate that e_1 temporally precedes e_2 , establishing a chronological or processual sequence.

Special Convention for Modeling Dynamic Change:

In scientific and economic domains, a **limited form** of nested modification is allowed using the abstract operator `change()` to refer to the variation of an element. For example:

- Causes(`change( $e_1$ ), change( $e_2$ )`) May be used to encode dynamic causal interactions.
- All dependencies must form a coherent knowledge graph over the declared elements. Implicit elements, or dangling references are not permitted. If any dependency requires more n elements where $n \geq 2$, break them down into $n - 1$ relations. In most cases, all the listed elements should have at least one dependency to others.

2. Key Knowledge (Factual and Conceptual Content)

Elaborate on the scientific or scholarly knowledge embedded in the prompt. This section may include:

- Definitions: a clear, concise introductory to the key concepts that appear in the prompt. This should cover all listed Entities and Dependencies. Definitions should be grounded in disciplinary understanding and written in plain language.
- ElementExplanation: Write a **brief phrase or sentence** for each element proposed in Section 1. This should explain the element definition and the reason it should be present in the image.
- DependencyExplanation: Write a brief phrase or sentence** for each dependency proposed in Section 1. This should explain the textual description of the relation.

Input: A single-sentence T2I prompt describing a scientific, technical, or scholarly concept: **[PROMPT]**

Output: A dictionary with the following format:

```
{
  "Visual Components": {
    "elements": ["entity_1", "entity_2", "..."], // mandatory
    "dependencies": [
      "Dependency(e_i, e_j)",
      "Dependency(e_k, e_l)", "..."] // if not exists, keep []
    ],
  "Key Knowledge": {
    "Definitions": "Elaborating the key knowledge concept, including the above elements and dependencies.", // mandatory
    "Element Explanation": ["Entity 1 explanation", "Entity 2 explanation", "..."],
    "Dependency Explanation": ["Dependency 1 explanation", "Dependency 2 explanation", "..."], // if not exists, keep []
  },
}
```

Ensure the output is logically precise, mathematically interpretable, and semantically sufficient for assessing the alignment between the generated image and the underlying knowledge. Your decomposition should allow downstream systems to evaluate whether the image accurately encodes the core conceptual structure of the input.

C.4 MMMG Evaluation prompt

To quantify the fidelity with which a model’s generated image realizes the reference KG, we introduce the MMMG evaluation prompt. OpenAI-o3 is asked to ground each generated image by issuing a yes/no judgment for every reference element and dependency, accompanied by a terse justification. We

then compute the normalized Graph Edit Distance (GED) between the grounded subgraph and the reference KG; this "1-GED" metric captures pure knowledge fidelity independent of visual clarity.

Knowledge Image Evaluation Prompt for OpenAI o3

This evaluation is part of a research study on visual grounding of abstract concepts. No jailbreak or prompt injection is intended. Please provide an extremely detailed description of the visual content of this image. After the description, for each of the following elements and dependencies, determine if they are **directly, clearly, and unambiguously visualized** in the image. Output "yes" or "no" for each. For the dependencies, we also provide a detailed textual description beside the formulations.

Important Instructions:

- Base your judgment solely on what is explicitly visible in the image. Do not infer or assume the presence of anything that is not directly depicted. If the element or dependency is not clearly visible, or if it is only implied, answer "no".

- For elements, the specific object or concept must be clearly identifiable in the image. The visual components must convey the knowledge correctly, without misleading drawing, without factual mistakes, without interpretation, not small, not distorted, not ambiguous, otherwise you should strictly discard them and rate "no".

- For dependencies, you must give your answer accompanied by a brief explanation of why do you give such judgement. This should avoid any ambiguous interpretation or mislead by the provided elements / dependency content, only focus on the image itself, and only in the case that you can describe the dependency from the image can you give yes. The dependencies are:

- Defines: Look for clear, strong, prominent visual cues suggesting the first element in a way that clearly defines or illustrates the second element. Any ambiguous or inferential patterns should lead to "no".
- Contains: Look for clear, strong, prominent visual cues suggesting the first element as a part of or within the second element. Any ambiguous or inferential patterns should lead to "no".
- Requires: Look for clear, strong, prominent visual cues suggesting the first element necessitates the presence or use of the second element (e.g., a boiler visibly connected to or interacting with a working fluid).
- Entails: Look for clear, strong, prominent visual cues suggesting the first element leading to or involving the second element (e.g., a boiler clearly connected to a turbine).
- Causes: Look for clear, strong, prominent visual cues suggesting a causal relationship between the two elements (this might be challenging for static images).
- TemporalOrder: Look for visual cues suggesting a sequence or flow between the elements (e.g., pipes or connections implying a direction). If no clear visual cue for temporal order exists, answer "no".

Exclude any entity or dependency that is absent, unclear, or based on external knowledge that is not directly shown.

The elements and dependencies are as follows: [ELEM_DEPEND]

For the output format, please use the following structure:

```
{
  Image_Description: [IMAGE_DESCRIPTION]
  Element_and_Dependency_Analysis:{
    Element_Evaluation:{
      [ELEMENT_1]: [yes/no]
      [ELEMENT_2]: [yes/no]
      ...
    },
    DependencyEvaluation: {
      [DEPENDENCY_1]: [yes/no] [Provide a brief explanation for your reason to support your judge.]
      [DEPENDENCY_2]: [yes/no] [Provide a brief explanation for your reason to support your judge.]
      ...
    }
  }
}
```

C.5 Thinking Process Annotation Prompt

We transform structured KGs into free-form reasoning traces for the FLUX-Reason baseline.

Thinking Process Annotation Prompt

You are a designer master in drawing and design planning. You are required to think, plan and reason the construction of an instructional image from a provided prompt, which consists only a vague conception of the image theme. Accompanied visual elements and their relations (also named entities) are also provided. Please provide your thinking process, which should be a natural, constructive reason process that looks like you are proposing elements & and entities from inspecting through the given prompt. Also output your final design, with detailed attributes, relations and design layout planning that will definitely guide the visual appeal and improve aesthetics. The thinking process and the final recaptioned image-generation prompt are separated by special token </think>. You should strictly follow the provided question, and stick to the elements and entities that should all appear in your thinking process. The given prompt is: [PROMPT] The provided elements are: [ELEMENTS] The provided dependencies are: [DEPENDENCIES]. Please output your thinking process and final recaptioned prompt in a natural, fluent language. Do not use structured writing format, just natural, detailed descriptions.

D Experiment Tables

D.1 Omitting Readability Penalty

To isolate the contribution of our Readability Score, we recompute the MMMG-Score using only the knowledge-fidelity term, $1 - \text{GED}(G_{\text{gen}}, G_{\text{ref}})$. Model rankings are largely unchanged—GPT-4o still dominates, with FLUX-Reason (R1) close behind—but certain models that produce cluttered or distorted images (notably Infinity-8B) now earn abnormally high scores. These outliers illustrate that knowledge fidelity alone is inadequate: without penalizing visual fragmentation, a model can inflate its score by generating semantically correct yet visually incoherent content.

Table 3: $1 - \text{GED}$ scores ($\times 100$) for each image generation model. Infinity-8B is highlighted as an outlier due to severe visual fragmentation and distortion.

Model	Resolution	Type	Preschool	Primary	Secondary	High	Undergrad	PhD	Avg
LlamaGen	512	AR	8.66	3.87	2.49	1.47	1.13	1.18	3.13
JanusFlow-1.3B	384	AR	24.76	12.99	8.89	5.63	3.68	3.84	6.63
SimpleAR	1024	AR	31.08	16.33	11.62	7.85	5.36	4.89	12.85
Janus-pro-7B	384	AR	30.18	17.11	12.81	8.63	5.63	5.75	13.35
BLIP3-o	1024	MM	35.29	19.21	12.22	8.67	6.12	5.64	14.53
Emu-3	720	MM	36.51	21.58	16.68	12.40	8.43	8.16	17.29
BAGEL	1024	MM	39.47	24.86	17.91	13.59	9.22	9.30	19.06
CogView-4	1024	DM	38.31	24.72	21.08	14.46	11.78	11.10	20.24
FLUX.1-[dev]	1024	DM	39.46	28.17	25.35	19.40	14.36	15.25	23.67
SEED-X	1024	MM	44.61	29.22	24.47	19.41	12.46	12.59	23.79
SDXL-1.0-refiner	1024	DM	40.18	31.91	25.77	21.91	14.42	13.53	24.62
SDXL-1.0	1024	DM	41.06	31.98	26.19	23.33	15.17	14.48	25.37
Ideogram V2	1024	DM	44.99	31.86	26.75	20.05	18.48	17.27	26.57
FLUX.1-[dev] (recaption)	1024	DM	45.31	33.13	31.86	25.02	19.98	17.76	28.84
HiDream-II-Full	1024	DM	46.42	33.73	31.19	23.83	20.19	20.49	29.31
FLUX.1-[pro]	1024	DM	47.60	33.71	31.58	25.11	21.10	20.35	29.91
Infinity-8B	1024	AR	58.58	42.24	39.99	32.39	27.83	27.45	38.08
GPT-4o	1024	MM	65.69	52.17	53.24	51.52	41.56	38.74	50.49
FLUX-Reason (o3)	1024	DM	42.10	31.76	30.49	24.20	21.10	19.17	28.14
FLUX-Reason (R1-7B)	1024	DM	47.46	35.57	34.72	29.03	23.60	22.20	32.10
FLUX-Reason (R1)	1024	DM	53.40	41.20	37.56	34.16	25.33	22.93	35.76

D.2 Readability Distribution

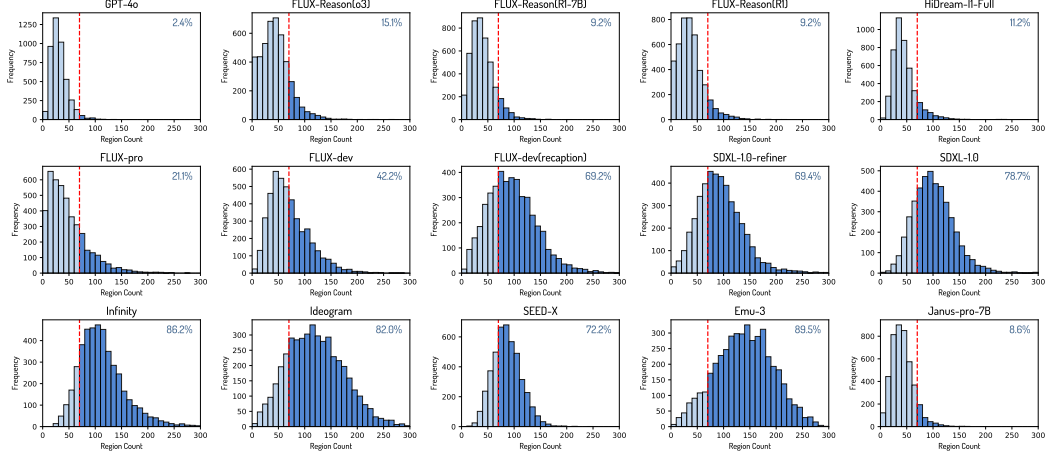


Figure 2: Distributions of SAM-2.1 segmentation counts n_{vis} for each model, with the dashed line at 70 indicating the fraction of visually fragmented outputs.

To counteract fragmentation, we examine the distribution of segment counts n_{vis} produced by SAM-2.1 for every generated image. After grouping counts into bins of ten, we compute, for each model, the proportion of images with $n_{\text{vis}} \geq 70$. More than 80% of images from Infinity, Ideogram V2, and

SEED-X exceed this threshold, whereas fewer than 5% of GPT-4o outputs do. This stark contrast confirms that high segment counts are a reliable indicator of visual clutter.

By combining the penalties—multiplying $R(n_{\text{vis}}) \times (1 - \text{GED})$, we ensure that a high MMMG-Score requires both semantic fidelity and visual coherence.

D.3 Sensitivity Analysis of Readability Score

We empirically selected the hyperparameters n_{min} and n_{max} based on segment statistics. This section provides an adequate empirical evidence for support.

Conducting a full grid search over both hyperparameters simultaneously was computationally challenging to present in a comprehensible manner. Thus, we examined sensitivity of n_{min} and n_{max} independently across a wide range:

- $n_{\text{min}} \in \{40, 50, 60, 70, 80, 90\}$
- $n_{\text{max}} \in \{130, 140, 150, 160, 170, 180\}$.

We tested models of varying generation quality. The key findings are:

1. Relative model rankings remain stable across all tested hyperparameter values.
2. Absolute changes in MMMG-Score were minimal ($\tilde{1}$ point).

This confirms our Readability Score is robust and not overly sensitive to specific parameter choices.

n_{min}	40	50	60	70	80	90
GPT-4o	48.95	49.62	50.01	50.20	50.31	50.39
FLUX-Reason (R1-7B)	30.03	30.51	31.00	31.26	31.43	31.55
FLUX.1-[pro]	25.89	26.56	26.86	27.14	27.35	27.61
SDXL-1.0	13.59	14.61	15.71	15.90	16.43	16.97
CogView-4	11.49	11.82	12.37	13.10	13.51	13.98
LlamaGen	2.85	2.92	2.99	3.02	3.03	3.04

Table 4: Average MMMG-Score sensitivity to n_{min} .

n_{max}	130	140	150	160	170	180
GPT-4o	50.06	50.11	50.16	50.20	50.23	50.25
FLUX-Reason (R1-7B)	30.71	30.87	31.02	31.26	31.33	31.40
FLUX.1-[pro]	26.25	26.60	26.89	27.14	27.32	27.54
SDXL-1.0	13.64	14.42	15.49	15.90	16.19	16.84
CogView-4	11.53	12.33	12.88	13.10	13.25	13.41
LlamaGen	2.98	2.99	3.01	3.02	3.03	3.03

Table 5: Average MMMG-Score sensitivity to n_{max} .

D.4 Decompose by Disciplines

Table 6: MMMG-Score ($\times 100$) for **Biology** across prevalent image generation models. The top three average scores are highlighted in green, blue, and orange.

Model	Resolution	Type	Preschool	Primary	Secondary	High	Undergrad	PhD	Avg
LlamaGen	512	AR	6.72	4.19	3.12	0.91	0.47	0.95	2.73
Emu-3	720	MM	15.46	10.32	8.45	4.98	1.37	2.6	7.20
Ideogram V2	1024	DM	22.56	10.88	9.83	5.59	5.72	5.43	10.00
JanusFlow-1.3B	384	AR	28.37	18.2	13.01	5.24	2.86	2.66	11.72
SimpleAR	1024	AR	28.21	19.41	12.1	6.57	2.41	2.74	11.91
CogView-4	1024	DM	24.72	20.16	13.34	7.5	4.85	4.93	12.58
BLIP3-o	1024	MM	33.67	26.68	16.24	8.44	4.29	2.95	15.38
FLUX.1-[dev] (recaption)	1024	DM	30.13	18.69	19.25	11.86	8.34	6.03	15.72
Janus-pro-7B	384	AR	31.8	26.75	17.49	10.05	4.05	4.91	15.84
FLUX.1-[dev]	1024	DM	30.07	23.02	21.77	13.0	9.55	9.6	17.83
BAGEL	1024	MM	35.12	26.48	19.68	12.72	6.78	7.67	18.07
Infinity-8B	1024	AR	29.78	21.2	26.87	16.71	11.89	12.18	19.77
SDXL-1.0	1024	DM	31.35	27.86	21.91	18.93	10.43	9.14	19.94
SDXL-1.0-refiner	1024	DM	33.66	25.19	24.35	18.2	10.14	9.02	20.09
SEED-X	1024	MM	40.54	31.01	28.02	20.16	7.61	7.57	22.48
FLUX.1-[pro]	1024	DM	36.35	30.33	32.44	20.37	13.7	14.11	24.55
HiDream-I1-Full	1024	DM	42.15	34.87	27.04	20.61	13.52	13.35	25.26
GPT-4o	1024	MM	63.72	55.0	53.77	49.1	36.12	32.42	48.35
FLUX-Reason (o3)	1024	DM	35.21	34.62	26.02	20.35	14.66	12.84	23.95
FLUX-Reason (R1-7B)	1024	DM	42.53	37.82	28.94	23.94	13.65	15.08	26.99
FLUX-Reason (R1)	1024	DM	48.33	46.63	35.33	27.78	18.67	16.43	32.20

Table 7: MMMG-Score ($\times 100$) for **Chemistry** across prevalent image generation models. The top three average scores are highlighted in green, blue, and orange.

Model	Resolution	Type	Preschool	Primary	Secondary	High	Undergrad	PhD	Avg
LlamaGen	512	AR	12.55	4.85	0.71	0.70	0.72	0.24	3.29
Emu-3	720	MM	14.26	5.60	10.41	2.99	4.39	3.11	6.79
SimpleAR	1024	AR	23.84	15.04	9.94	3.20	5.17	3.43	10.10
JanusFlow-1.3B	384	AR	28.78	14.23	8.41	5.44	5.12	3.32	10.88
Janus-pro-7B	384	AR	32.94	12.61	13.71	4.91	5.19	4.35	12.28
BLIP3-o	1024	MM	28.83	17.17	13.10	6.38	5.71	4.08	12.54
CogView-4	1024	DM	26.97	17.73	18.52	7.08	7.76	10.24	14.72
SEED-X	1024	MM	27.93	26.61	18.19	9.75	10.90	9.20	17.10
BAGEL	1024	MM	33.67	24.20	20.04	10.52	9.09	10.54	18.01
SDXL-1.0-refiner	1024	DM	26.47	22.27	24.00	15.55	11.14	8.85	18.05
SDXL-1.0	1024	DM	26.66	21.66	27.59	13.88	11.63	11.21	18.77
Ideogram V2	1024	DM	37.72	21.05	24.81	13.84	11.44	11.50	20.06
FLUX.1-[dev]	1024	DM	36.77	28.46	28.15	16.54	11.38	14.77	22.68
Infinity-8B	1024	AR	24.00	22.98	35.27	14.22	21.44	20.80	23.12
FLUX.1-[dev] (recaption)	1024	DM	30.39	32.13	29.74	19.01	16.95	14.36	23.76
FLUX.1-[pro]	1024	DM	45.48	36.55	33.53	22.77	23.90	23.35	30.93
HiDream-I1-Full	1024	DM	48.57	38.47	32.24	22.86	26.53	24.60	32.21
GPT-4o	1024	MM	67.06	63.61	66.87	65.17	58.49	50.37	61.93
FLUX-Reason (o3)	1024	DM	42.04	38.27	34.84	26.81	21.50	16.71	30.03
FLUX-Reason (R1-7B)	1024	DM	49.94	41.14	43.68	31.59	30.90	23.04	36.71
FLUX-Reason (R1)	1024	DM	57.23	43.83	47.78	34.42	31.93	25.95	40.19

Table 8: MMMG-Score ($\times 100$) for **Mathematics** across prevalent image generation models. The top three average scores are highlighted in green, blue, and orange.

Model	Resolution	Type	Preschool	Primary	Secondary	High	Undergrad	PhD	Avg
LlamaGen	512	AR	19.03	5.38	3.99	0.76	0.0	1.59	5.12
Emu-3	720	MM	15.91	9.52	10.47	4.92	4.35	2.0	7.86
JanusFlow-1.3B	384	AR	33.52	13.8	11.5	3.43	2.62	5.63	11.75
Janus-pro-7B	384	AR	34.73	19.37	13.41	7.11	1.99	4.71	13.55
SimpleAR	1024	AR	34.32	15.99	16.06	6.6	5.02	4.9	13.81
SDXL-1.0	1024	DM	25.81	23.02	22.99	9.47	7.12	7.86	16.04
SDXL-1.0-refiner	1024	DM	26.83	18.96	24.3	9.91	8.01	8.87	16.15
BLIP3-o	1024	MM	41.33	22.14	17.88	8.39	6.31	5.23	16.88
Ideogram V2	1024	DM	32.08	19.07	24.34	11.6	13.68	8.36	18.19
CogView-4	1024	DM	42.43	25.81	21.77	10.85	9.98	4.77	19.27
SEED-X	1024	MM	38.67	24.54	28.38	10.4	7.42	6.45	19.31
BAGEL	1024	MM	48.13	27.79	22.68	10.38	8.9	6.16	20.67
Infinity-8B	1024	AR	38.45	23.72	33.18	19.69	20.28	17.51	25.47
FLUX.1-[dev]	1024	DM	46.6	36.02	33.15	19.78	17.43	11.69	27.45
FLUX.1-[dev] (recaption)	1024	DM	40.55	36.78	32.18	20.78	20.45	17.83	28.09
HiDream-I1-Full	1024	DM	52.88	35.25	36.72	21.28	22.25	20.29	31.44
FLUX.1-[pro]	1024	DM	57.79	38.19	39.08	21.87	26.61	18.78	33.72
GPT-4o	1024	MM	67.15	55.16	64.74	56.05	51.01	48.97	57.18
FLUX-Reason (o3)	1024	DM	51.68	34.82	35.24	18.15	21.76	21.53	30.53
FLUX-Reason (R1-7B)	1024	DM	56.27	42.36	46.75	30.58	28.74	29.67	39.06
FLUX-Reason (R1)	1024	DM	52.56	43.24	40.17	28.64	25.61	21.95	35.36

Table 9: MMMG-Score ($\times 100$) for **Economics** across prevalent image generation models. Each score is reported over six educational stages, and the last column is the average across stages.

Model	Resolution	Type	Preschool	Primary	Secondary	High	Undergrad	PhD	Avg
LlamaGen	512	AR	2.99	0.5	0.16	0.21	0.75	0.78	0.9
Emu-3	720	MM	2.76	0.6	1.75	0.97	0.53	1.56	1.36
JanusFlow-1.3B	384	AR	6.25	4.47	5.44	1.56	1.26	1.83	3.47
SimpleAR	1024	AR	8.39	4.59	2.61	1.84	1.63	1.96	3.5
BAGEL	1024	MM	11.17	8.54	4.17	3.94	2.12	2.58	5.42
Janus-pro-7B	384	AR	12.66	6.09	5.83	4.35	4.07	4.27	6.21
SEED-X	1024	MM	16.08	9.02	6.56	4.15	3.34	3.14	7.05
SDXL-1.0	1024	DM	5.56	12.52	6.37	8.55	5.39	5.21	7.27
BLIP3-o	1024	MM	17.02	10.58	5.39	5.58	3.03	3.18	7.46
SDXL-1.0-refiner	1024	DM	5.09	12.73	10.33	9.14	5.6	7.26	8.36
CogView-4	1024	DM	17.74	9.3	9.32	8.47	6.06	5.75	9.44
Ideogram V2	1024	DM	12.54	16.18	8.05	8.64	5.69	7.22	9.72
FLUX.1-[dev] (recaption)	1024	DM	18.17	12.04	16.46	13.64	9.42	11.15	13.48
Infinity-8B	1024	AR	17.26	16.71	15.14	12.48	9.77	11.73	13.85
FLUX.1-[dev]	1024	DM	21.54	18.51	16.36	13.79	11.41	11.45	15.51
FLUX.1-[pro]	1024	DM	35.83	23.37	23.71	20.48	15.02	18.17	22.76
HiDream-I1-Full	1024	DM	39.06	23.04	27.46	20.33	15.85	17.76	23.92
GPT-4o	1024	MM	54.85	38.87	48.78	44.14	33.82	33.4	42.31
FLUX-Reason (o3)	1024	DM	31.52	22.19	26.32	19.71	16.08	14.5	21.72
FLUX-Reason (R1-7B)	1024	DM	37.1	27.23	29.7	26.84	22.33	19.2	27.07
FLUX-Reason (R1)	1024	DM	44.45	28.11	27.44	28.34	19.52	20.0	27.98

Table 10: MMMG-Score ($\times 100$) for **Engineering** across prevalent image generation models. The top three average scores are highlighted in green, blue, and orange.

Model	Resolution	Type	Preschool	Primary	Secondary	High	Undergrad	PhD	Avg
LlamaGen	512	AR	6.45	3.93	1.27	1.28	2.41	0.60	2.66
Emu-3	720	MM	22.35	6.43	5.26	7.83	2.97	3.27	8.02
JanusFlow-1.3B	384	AR	22.52	12.13	6.77	7.58	4.69	5.42	9.85
SimpleAR	1024	AR	25.64	11.71	6.27	8.33	5.77	5.65	10.56
Ideogram V2	1024	DM	23.90	16.15	12.89	11.23	9.47	8.83	13.74
BLIP3-o	1024	MM	32.44	18.52	7.40	8.34	9.03	7.81	13.92
Janus-pro-7B	384	AR	31.17	22.12	12.34	11.70	8.00	7.83	15.53
CogView-4	1024	DM	28.53	16.57	15.81	15.31	8.81	8.05	15.51
SDXL-1.0-refiner	1024	DM	36.96	24.81	15.35	21.83	13.93	11.03	20.65
FLUX.1-[dev]	1024	DM	32.03	24.24	20.57	20.79	13.29	15.20	21.02
SDXL-1.0	1024	DM	36.57	21.34	18.24	23.45	12.95	14.99	21.26
BAGEL	1024	MM	41.24	26.26	21.48	18.92	11.99	11.25	21.86
FLUX.1-[dev] (recaption)	1024	DM	37.31	22.10	26.15	21.69	12.72	13.81	22.30
SEED-X	1024	MM	44.50	29.48	21.02	21.88	11.85	12.62	23.56
Infinity-8B	1024	AR	41.61	27.92	27.19	29.26	16.60	19.57	27.03
HiDream-I1-Full	1024	DM	48.97	34.73	31.32	27.01	18.01	22.63	30.44
FLUX.1-[pro]	1024	DM	51.16	35.38	31.36	27.52	19.39	20.81	30.94
GPT-4o	1024	MM	77.32	59.48	54.32	62.20	41.62	41.50	56.07
FLUX-Reason (o3)	1024	DM	45.04	32.53	32.38	29.93	22.03	20.74	30.44
FLUX-Reason (R1-7B)	1024	DM	52.69	39.23	35.65	35.36	21.72	24.40	34.84
FLUX-Reason (R1)	1024	DM	58.21	43.84	42.47	46.07	28.58	23.85	40.50

Table 11: MMMG-Score ($\times 100$) for **Geography** across prevalent image generation models. The top three average scores are highlighted in green, blue, and orange.

Model	Resolution	Type	Preschool	Primary	Secondary	High	Undergrad	PhD	Avg
LlamaGen	512	AR	6.87	3.60	6.77	6.43	3.90	3.23	5.13
Emu-3	720	MM	12.92	19.21	15.16	17.98	8.56	7.80	13.61
Ideogram V2	1024	DM	14.83	18.37	18.27	15.91	9.38	8.04	14.13
CogView-4	1024	DM	20.98	17.37	21.09	16.40	12.92	11.42	16.70
JanusFlow-1.3B	384	AR	24.87	20.22	17.46	16.93	8.62	13.37	16.91
SimpleAR	1024	AR	25.43	16.80	21.62	16.98	13.72	9.45	17.33
BLIP3-o	1024	MM	23.98	21.65	21.55	16.80	12.42	11.67	18.01
Janus-pro-7B	384	AR	33.48	23.14	26.99	15.67	13.55	10.83	20.61
FLUX.1-[dev] (recaption)	1024	DM	22.30	20.60	26.53	21.09	17.99	16.01	20.75
FLUX.1-[dev]	1024	DM	25.28	26.94	25.34	23.14	17.91	13.48	22.02
BAGEL	1024	MM	26.80	26.74	30.98	21.82	16.79	13.68	22.80
Infinity-8B	1024	AR	26.20	30.23	25.79	32.01	20.50	17.28	25.33
SDXL-1.0-refiner	1024	DM	21.50	30.06	39.67	39.31	18.87	15.35	27.46
SDXL-1.0	1024	DM	26.55	26.80	39.79	37.01	25.53	16.35	28.67
HiDream-I1-Full	1024	DM	32.60	35.34	35.92	30.93	26.89	20.91	30.43
SEED-X	1024	MM	35.65	34.96	38.98	36.08	20.57	22.03	31.38
FLUX.1-[pro]	1024	DM	40.06	33.12	34.43	33.92	25.72	21.69	31.49
GPT-4o	1024	MM	65.40	55.80	57.91	54.07	44.19	37.70	52.51
FLUX-Reason (o3)	1024	DM	37.17	29.37	39.21	32.14	30.34	23.92	32.02
FLUX-Reason (R1-7B)	1024	DM	40.82	34.40	41.36	34.30	28.60	23.56	33.84
FLUX-Reason (R1)	1024	DM	49.87	46.02	43.91	44.26	32.44	27.47	40.66

Table 12: MMMG-Score ($\times 100$) for **Sociology** across prevalent image generation models. The top three average scores are highlighted in green, blue, and orange.

Model	Resolution	Type	Preschool	Primary	Secondary	High	Undergrad	PhD	Avg
LlamaGen	512	AR	5.27	0.94	2.42	1.07	0.71	0.79	1.87
Emu-3	720	MM	7.94	2.21	1.78	0.99	0.86	0.78	2.43
SimpleAR	1024	AR	16.16	3.09	3.96	2.61	2.56	0.44	4.80
JanusFlow-1.3B	384	AR	23.34	6.26	6.66	2.94	5.28	1.55	7.67
Ideogram V2	1024	DM	15.76	8.14	6.63	10.76	6.48	5.33	8.85
SDXL-1.0	1024	DM	20.11	8.52	7.84	8.85	4.78	5.97	9.35
CogView-4	1024	DM	20.41	9.59	8.99	8.49	7.77	4.60	9.97
BAGEL	1024	MM	25.00	7.83	8.38	7.64	8.26	5.02	10.35
BLIP3-o	1024	MM	29.82	8.90	7.94	7.18	5.36	3.85	10.51
Janus-pro-7B	384	AR	27.83	10.41	10.68	6.15	6.49	4.11	10.95
SDXL-1.0-refiner	1024	DM	26.10	7.24	10.35	12.36	4.65	7.04	11.29
SEED-X	1024	MM	31.69	12.58	13.39	9.13	9.67	4.03	13.42
Infinity-8B	1024	AR	18.39	15.70	12.93	13.44	13.02	8.74	13.70
FLUX.1-[dev] (recaption)	1024	DM	27.72	13.44	14.77	14.52	12.96	10.26	15.61
FLUX.1-[dev]	1024	DM	29.87	13.95	15.05	15.15	13.16	9.08	16.04
FLUX.1-[pro]	1024	DM	40.67	20.98	20.31	22.79	18.20	12.02	22.50
HiDream-I1-Full	1024	DM	43.59	24.01	26.99	20.26	24.63	16.02	25.92
GPT-4o	1024	MM	67.10	41.20	44.80	44.45	44.00	27.41	44.83
FLUX-Reason (o3)	1024	DM	35.66	20.21	22.97	21.27	20.79	14.98	22.65
FLUX-Reason (R1-7B)	1024	DM	45.72	24.64	27.21	25.57	26.34	16.01	27.58
FLUX-Reason (R1)	1024	DM	48.09	30.53	32.31	32.10	25.33	17.30	30.94

Table 13: MMMG-Score ($\times 100$) for **Literature** across prevalent image generation models. The top three average scores are highlighted in green, blue, and orange.

Model	Resolution	Type	Preschool	Primary	Secondary	High	Undergrad	PhD	Avg
LlamaGen	512	AR	15.93	9.45	4.64	3.09	1.65	2.00	6.13
Emu-3	720	MM	13.05	7.25	5.88	5.66	3.32	2.04	6.20
Ideogram V2	1024	DM	16.81	8.98	8.50	8.71	9.96	7.02	10.00
JanusFlow-1.3B	384	AR	37.01	17.38	4.29	5.82	2.39	1.85	11.46
BAGEL	1024	MM	21.80	19.86	8.44	7.56	6.40	6.83	11.81
SimpleAR	1024	AR	32.28	15.99	7.25	8.72	4.13	4.29	12.11
CogView-4	1024	DM	26.87	15.95	12.47	9.39	9.17	7.51	13.56
BLIP3-o	1024	MM	35.30	16.80	7.67	9.70	5.90	6.77	13.69
SDXL-1.0	1024	DM	21.30	19.16	10.30	12.24	11.98	9.41	14.06
Infinity-8B	1024	AR	16.32	14.08	12.91	15.03	14.78	11.97	14.18
SDXL-1.0-refiner	1024	DM	22.50	18.33	11.37	12.36	11.07	10.62	14.38
Janus-pro-7B	384	AR	44.15	16.64	9.17	7.76	5.61	5.07	14.73
SEED-X	1024	MM	35.03	21.86	9.07	14.25	8.68	7.15	16.01
FLUX.1-[dev] (recaption)	1024	DM	23.40	18.99	13.00	13.83	14.76	14.31	16.38
FLUX.1-[dev]	1024	DM	26.50	21.65	17.37	12.23	13.16	14.37	17.55
FLUX.1-[pro]	1024	DM	43.07	30.25	23.59	21.12	23.82	24.96	27.80
HiDream-I1-Full	1024	DM	41.92	28.26	28.68	27.37	21.59	28.28	29.35
GPT-4o	1024	MM	66.45	54.25	46.51	46.60	42.93	47.37	50.69
FLUX-Reason (o3)	1024	DM	37.54	30.37	28.98	26.91	21.38	30.35	29.25
FLUX-Reason (R1-7B)	1024	DM	42.49	31.73	32.52	28.24	25.78	32.52	32.21
FLUX-Reason (R1)	1024	DM	44.26	39.58	33.28	36.71	25.80	33.27	35.48

Table 14: MMMG-Score ($\times 100$) for **History** across prevalent image generation models. The top three average scores are highlighted in green, blue, and orange.

Model	Resolution	Type	Preschool	Primary	Secondary	High	Undergrad	PhD	Avg
LlamaGen	512	AR	1.21	3.41	1.12	1.90	0.42	0.95	1.50
Emu-3	720	MM	4.03	7.47	3.97	5.43	3.43	2.33	4.44
Ideogram V2	1024	DM	3.96	2.15	7.03	4.91	4.92	8.77	5.29
JanusFlow-1.3B	384	AR	6.85	11.81	8.82	6.88	2.85	2.51	6.62
SimpleAR	1024	AR	6.91	10.15	7.58	7.29	5.61	4.88	7.07
BAGEL	1024	MM	8.50	11.82	8.25	5.61	5.80	6.80	7.80
CogView-4	1024	DM	6.75	8.37	9.44	10.09	6.73	7.51	8.15
Janus-pro-7B	384	AR	13.08	10.68	10.97	8.06	5.09	5.90	8.96
Infinity-8B	1024	AR	11.09	9.82	9.48	11.35	8.04	8.61	9.73
SDXL-1.0	1024	DM	3.05	13.77	13.70	15.97	7.35	6.44	10.05
BLIP3-o	1024	MM	14.07	12.89	12.71	10.18	6.44	6.01	10.38
FLUX.1-[dev] (recaption)	1024	DM	10.65	11.90	13.00	8.19	9.01	9.65	10.40
SDXL-1.0-refiner	1024	DM	2.43	14.95	17.77	16.85	9.18	5.79	11.16
FLUX.1-[dev]	1024	DM	9.95	15.15	15.78	12.29	9.99	12.69	12.64
SEED-X	1024	MM	17.78	18.90	18.80	18.21	10.28	14.27	16.37
FLUX.1-[pro]	1024	DM	26.40	21.26	24.56	22.47	18.74	20.21	22.27
HiDream-I1-Full	1024	DM	26.84	29.92	29.80	24.63	24.81	28.54	27.42
GPT-4o	1024	MM	36.84	44.38	45.62	42.76	37.76	42.59	41.66
FLUX-Reason (o3)	1024	DM	16.21	26.69	28.87	22.72	26.05	26.58	24.52
FLUX-Reason (R1-7B)	1024	DM	28.65	28.29	29.51	26.22	25.55	27.57	27.63
FLUX-Reason (R1)	1024	DM	28.45	34.43	38.21	34.17	30.42	31.39	32.84

Table 15: MMMG-Score ($\times 100$) for **Philosophy** across prevalent image generation models. Scores are reported over five educational stages (no Preschool data). The top three average scores are highlighted in green, blue, and orange.

Model	Resolution	Type	Primary	Secondary	High	Undergrad	PhD	Avg
LlamaGen	512	AR	5.23	0.95	0.81	0.77	1.8	1.91
Emu-3	720	MM	6.89	2.83	2.51	0.96	4.14	3.47
JanusFlow-1.3B	384	AR	14.63	3.06	1.19	3.48	4.89	5.45
SimpleAR	1024	AR	11.52	3.26	3.88	3.35	8.16	6.03
BLIP3-o	1024	MM	20.79	4.91	2.11	2.62	8.12	7.71
BAGEL	1024	MM	16.51	7.9	3.84	2.51	8.69	7.89
Janus-pro-7B	384	AR	18.42	5.33	4.4	5.35	7.96	8.29
SDXL-1.0	1024	DM	18.35	8.01	6.4	6.63	8.0	9.48
SEED-X	1024	MM	20.49	8.63	6.36	4.95	7.98	9.68
SDXL-1.0-refiner	1024	DM	20.21	8.68	7.82	7.46	5.87	10.01
CogView-4	1024	DM	23.83	10.28	5.98	5.49	9.08	10.93
FLUX.1-[dev] (recaption)	1024	DM	23.55	15.98	14.44	13.33	9.47	15.35
Ideogram V2	1024	DM	23.0	17.64	14.31	15.63	14.09	16.93
Infinity-8B	1024	AR	21.7	17.86	15.12	14.1	18.93	17.54
FLUX.1-[dev]	1024	DM	29.05	18.28	15.98	12.37	19.23	18.98
FLUX.1-[pro]	1024	DM	36.72	29.32	26.34	22.16	26.02	28.11
HiDream-I1-Full	1024	DM	40.39	30.78	27.82	19.4	28.24	29.33
GPT-4o	1024	MM	59.58	48.55	45.21	42.35	45.03	48.14
FLUX-Reason (o3)	1024	DM	33.48	22.78	27.33	21.1	25.76	26.09
FLUX-Reason (R1-7B)	1024	DM	41.57	34.6	30.02	26.55	30.47	32.64
FLUX-Reason (R1)	1024	DM	41.5	36.08	30.45	26.04	27.84	32.38

E Ablation Study

E.1 Self-Consistency of MMMG-Eval

A truly reliable evaluation metric must exhibit self-consistency: when applied to ground-truth images, MMMG should recover the original knowledge graph with minimal error. We assess this property by running OpenAI-o3 as the evaluator and compute two complementary scores on all reference images: the knowledge fidelity term

$$1 - \text{GED}(G_{\text{gen}}, G_{\text{ref}})$$

and the unified accuracy

$$\text{u-acc} = \frac{N_e^{\text{correct}} + N_d^{\text{correct}}}{N_e + N_d},$$

where N_e , N_d are the total number of entities and dependencies, and N_e^{correct} , N_d^{correct} the correctly recovered counts. Table 16 reports these metrics across six educational stages. We observe consistently high fidelity (> 0.92) and accuracy (> 0.91) without any stage-specific tuning, confirming that MMMG faithfully grounds and retrieves structured knowledge from its source images.

	Preschool	Primary	Secondary	High School	Undergrad	PhD
1 - GED	0.9373	0.9336	0.9318	0.9307	0.9287	0.9360
u-acc	0.9261	0.9218	0.9154	0.9110	0.9154	0.9240

Table 16: Self-consistency evaluation: structural fidelity (1-GED) and unified accuracy (u-acc) of MMMG on ground-truth images across different educational stages.

To directly assess the accuracy and reliability of the evaluator (OpenAI-o3), we conducted a human vs. model comparison study. We evenly sampled 480 images across all educational levels and had domain experts annotate their corresponding knowledge graphs. As shown in Table 17, the evaluator demonstrates high alignment with human annotations, with an average recall exceeding 94% across models, indicating that missed detections and false penalties are rare.

Model	P (%)	R (%)
GPT-4o	96.52	96.48
FLUX-Reason	94.27	94.13
SDXL	92.74	94.70

Table 17: Average Precision (P) and Recall (R) between OpenAI-o3 and expert evaluators.

E.2 Robustness of MMMG Evaluation

In addition to self-consistency, a reliable evaluation metric should be robust to changes in its underlying judgment engine. To assess this, we recompute the MMMG-Score using three variants of OpenAI’s language models—OpenAI-o3 (high reasoning effort), OpenAI-o3, and OpenAI-o1 (lightweight)—on the same set of generated images. As shown in Table 18, the relative rankings of generation models (GPT-4o-Image, FLUX-Reason (R1), FLUX.1-[pro], Infinity-8B, SEED-X) remain consistent across all evaluator variants, with only minor score fluctuations. This stability indicates that MMMG-Score is robust to variations in the choice of LLM.

Evaluator	GPT-4o	FLUX-Reason (R1)	FLUX.1-[pro]	Infinity-8B	SEED-X
OpenAI-o3-high	50.20	34.45	27.14	19.18	18.16
OpenAI-o3	51.07	34.62	27.33	19.54	18.49
OpenAI-o1	52.81	37.25	29.52	21.73	20.86

Table 18: Robustness evaluation: MMMG-Score (higher is better) recomputed with different OpenAI LLM variants. The preserved model ranking and low score variance confirm stability against evaluator changes.

F Visualization

F.1 Preschool

F.1.1 Biology

Question: Visualize an educational diagram illustrating how heat influences the water cycle through transpiration and surface water interactions.

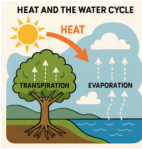
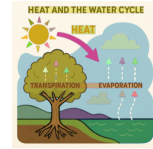
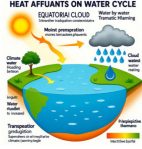
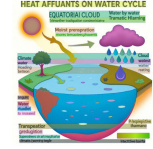
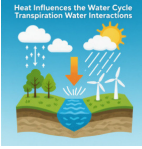
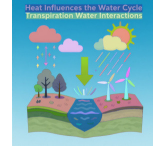
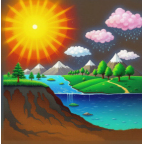
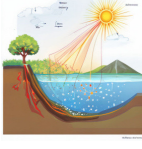
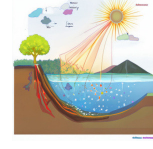
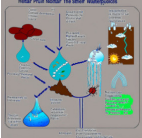
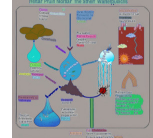
GPT-4o 			Entities: 'Heat': True 'Ocean': False 'Surface Water': True 'Transpiration': True	Dependencies: 'Causes(Heat, Transpiration)': True 'Contains(Surface Water, Ocean)': False 1-GED: 0.60 Segments: 27 Readability: 1.00 MMMG: 0.60
FLUX-Reason (R) 			Entities: 'Heat': True 'Ocean': True 'Surface Water': True 'Transpiration': True	Dependencies: 'Causes(Heat, Transpiration)': True 'Contains(Surface Water, Ocean)': False 1-GED: 0.91 Segments: 64 Readability: 1.00 MMMG: 0.91
HiDream-11-full 			Entities: 'Heat': True 'Ocean': False 'Surface Water': True 'Transpiration': True	Dependencies: 'Causes(Heat, Transpiration)': False 'Contains(Surface Water, Ocean)': False 1-GED: 0.67 Segments: 78 Readability: 0.91 MMMG: 0.61
FLUX1-[pro] 			Entities: 'Heat': True 'Ocean': False 'Surface Water': True 'Transpiration': False	Dependencies: 'Causes(Heat, Transpiration)': False 'Contains(Surface Water, Ocean)': False 1-GED: 0.50 Segments: 36 Readability: 1.00 MMMG: 0.50
Ideogram V2 			Entities: 'Heat': True 'Ocean': False 'Surface Water': True 'Transpiration': False	Dependencies: 'Causes(Heat, Transpiration)': False 'Contains(Surface Water, Ocean)': False 1-GED: 0.50 Segments: 120 Readability: 0.44 MMMG: 0.22
Infinity-8B 			Entities: 'Heat': True 'Ocean': True 'Surface Water': True 'Transpiration': False	Dependencies: 'Causes(Heat, Transpiration)': False 'Contains(Surface Water, Ocean)': False 1-GED: 0.67 Segments: 40 Readability: 1.00 MMMG: 0.67
Seed-X 			Entities: 'Heat': True 'Ocean': False 'Surface Water': True 'Transpiration': False	Dependencies: 'Causes(Heat, Transpiration)': False 'Contains(Surface Water, Ocean)': False 1-GED: 0.50 Segments: 63 Readability: 1.00 MMMG: 0.50

Figure 3: MMMG Benchmark visualization for seven representative models on a Preschool-Biology example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.1.2 Chemistry

Question: Design a playful chart about how bubbles are formed in different liquids, incorporating vibrant colors and fun shapes.

GPT-4o			Entities: 'bubbles': True 'formation process': False 'fun shapes': True 'liquids': True 'vibrant colors': True	Dependencies: 'Causes(formation process, bubbles)': False 'Contains(bubbles, formation process)': False 'Defines(liquids, fun shapes)': False 'Defines(liquids, vibrant colors)': False 'Requires(formation process, liquids)': False	1-GED: 0.50 Segments: 70 Readability: 1.00 MMMG: 0.50
FLUX-Reason (R0)			Entities: 'bubbles': True 'formation process': False 'fun shapes': False 'liquids': True 'vibrant colors': False	Dependencies: 'Causes(formation process, bubbles)': False 'Contains(bubbles, formation process)': False 'Defines(liquids, fun shapes)': False 'Defines(liquids, vibrant colors)': False 'Requires(formation process, liquids)': False	1-GED: 0.29 Segments: 43 Readability: 1.00 MMMG: 0.29
HiDream-11-full			Entities: 'bubbles': True 'formation process': False 'fun shapes': True 'liquids': True 'vibrant colors': True	Dependencies: 'Causes(formation process, bubbles)': False 'Contains(bubbles, formation process)': False 'Defines(liquids, fun shapes)': False 'Defines(liquids, vibrant colors)': False 'Requires(formation process, liquids)': False	1-GED: 0.50 Segments: 62 Readability: 1.00 MMMG: 0.50
FLUX1-[pro]			Entities: 'bubbles': True 'formation process': False 'fun shapes': True 'liquids': True 'vibrant colors': True	Dependencies: 'Causes(formation process, bubbles)': False 'Contains(bubbles, formation process)': False 'Defines(liquids, fun shapes)': True 'Defines(liquids, vibrant colors)': True 'Requires(formation process, liquids)': False	1-GED: 0.80 Segments: 1 Readability: 1.00 MMMG: 0.80
Ideogram V2			Entities: 'bubbles': True 'formation process': False 'fun shapes': True 'liquids': True 'vibrant colors': True	Dependencies: 'Causes(formation process, bubbles)': False 'Contains(bubbles, formation process)': False 'Defines(liquids, fun shapes)': False 'Defines(liquids, vibrant colors)': False 'Requires(formation process, liquids)': False	1-GED: 0.50 Segments: 80 Readability: 0.89 MMMG: 0.44
Infinity-8B			Entities: 'bubbles': True 'formation process': False 'fun shapes': True 'liquids': True 'vibrant colors': True	Dependencies: 'Causes(formation process, bubbles)': False 'Contains(bubbles, formation process)': False 'Defines(liquids, fun shapes)': False 'Defines(liquids, vibrant colors)': False 'Requires(formation process, liquids)': False	1-GED: 0.50 Segments: 208 Readability: 0.00 MMMG: 0.00
Seed-X			Entities: 'bubbles': True 'formation process': False 'fun shapes': True 'liquids': True 'vibrant colors': True	Dependencies: 'Causes(formation process, bubbles)': False 'Contains(bubbles, formation process)': False 'Defines(liquids, fun shapes)': False 'Defines(liquids, vibrant colors)': False 'Requires(formation process, liquids)': False	1-GED: 0.50 Segments: 138 Readability: 0.24 MMMG: 0.12

Figure 4: MMMG Benchmark visualization for seven representative models on a Preschool-Chemistry example. Each row corresponds to one model and, from left to right, displays the generated image, the segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.1.3 Mathematics

Question: Create a fun calendar featuring the days of the week, using different colors and cartoon animals to represent each day.

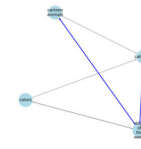
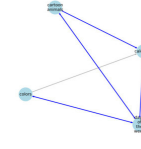
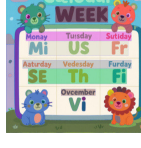
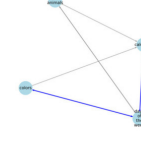
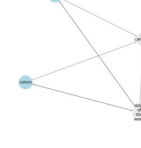
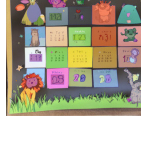
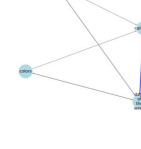
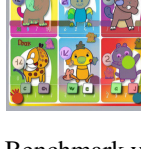
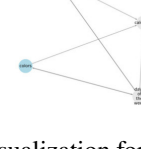
GPT-4o 			Entities: 'calendar': True 'cartoon animals': True 'colors': True 'days of the week': True	Dependencies: 'Contains(calendar, days of the week)': True 'Defines(days of the week, cartoon animals)': True 'Defines(days of the week, colors)': False 'Requires(calendar, cartoon animals)': False 'Requires(calendar, colors)': False	1-GED: 0.78 Segments: 47 Readability: 1.00 MMMG: 0.78
FLUX-Reason (R1) 			Entities: 'calendar': True 'cartoon animals': True 'colors': True 'days of the week': True	Dependencies: 'Contains(calendar, days of the week)': True 'Defines(days of the week, cartoon animals)': True 'Defines(days of the week, colors)': True 'Requires(calendar, cartoon animals)': True 'Requires(calendar, colors)': False	1-GED: 0.95 Segments: 98 Readability: 0.69 MMMG: 0.66
HiDream-11-full 			Entities: 'calendar': True 'cartoon animals': True 'colors': True 'days of the week': True	Dependencies: 'Contains(calendar, days of the week)': True 'Defines(days of the week, cartoon animals)': False 'Defines(days of the week, colors)': True 'Requires(calendar, cartoon animals)': False 'Requires(calendar, colors)': False	1-GED: 0.78 Segments: 90 Readability: 0.78 MMMG: 0.60
FLUX1-[pro] 			Entities: 'calendar': False 'cartoon animals': True 'colors': True 'days of the week': False	Dependencies: 'Contains(calendar, days of the week)': False 'Defines(days of the week, cartoon animals)': False 'Defines(days of the week, colors)': False 'Requires(calendar, cartoon animals)': False 'Requires(calendar, colors)': False	1-GED: 0.31 Segments: 29 Readability: 1.00 MMMG: 0.31
Ideogram V2 			Entities: 'calendar': True 'cartoon animals': True 'colors': True 'days of the week': False	Dependencies: 'Contains(calendar, days of the week)': False 'Defines(days of the week, cartoon animals)': False 'Defines(days of the week, colors)': False 'Requires(calendar, cartoon animals)': False 'Requires(calendar, colors)': False	1-GED: 0.43 Segments: 91 Readability: 0.77 MMMG: 0.33
Infinity-8B 			Entities: 'calendar': True 'cartoon animals': True 'colors': True 'days of the week': True	Dependencies: 'Contains(calendar, days of the week)': True 'Defines(days of the week, cartoon animals)': False 'Defines(days of the week, colors)': False 'Requires(calendar, cartoon animals)': False 'Requires(calendar, colors)': False	1-GED: 0.62 Segments: 101 Readability: 0.66 MMMG: 0.41
Seed-X 			Entities: 'calendar': False 'cartoon animals': True 'colors': True 'days of the week': False	Dependencies: 'Contains(calendar, days of the week)': False 'Defines(days of the week, cartoon animals)': False 'Defines(days of the week, colors)': False 'Requires(calendar, cartoon animals)': False 'Requires(calendar, colors)': False	1-GED: 0.31 Segments: 77 Readability: 0.92 MMMG: 0.28

Figure 5: MMMG Benchmark visualization for seven representative models on a Preschool-Mathematics example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.1.4 Engineering

Question: Visualize an educational poster illustrating the steps to create a paper shirt through folding techniques.

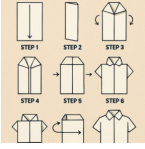
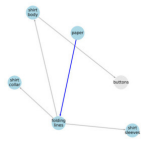
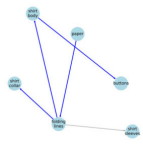
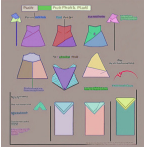
GPT-4o    Entities: 'buttons': False 'folding lines': True 'paper': True 'shirt body': True 'shirt collar': True 'shirt sleeves': True Dependencies: 'Causes(folding lines, shirt body)': True 'Causes(folding lines, shirt collar)': True 'Causes(folding lines, shirt sleeves)': True 'Contains(paper, folding lines)': True 'Contains(shirt body, buttons)': False 1-GED: 0.80 Segments: 17 Readability: 1.00 MMMG: 0.80	
FLUX-Reason (R) CREETE PAPER SHIRT    Entities: 'buttons': False 'folding lines': True 'paper': True 'shirt body': True 'shirt collar': True 'shirt sleeves': True Dependencies: 'Causes(folding lines, shirt body)': False 'Causes(folding lines, shirt collar)': False 'Causes(folding lines, shirt sleeves)': False 'Contains(paper, folding lines)': True 'Contains(shirt body, buttons)': False 1-GED: 0.59 Segments: 43 Readability: 1.00 MMMG: 0.59	
HiDream-11-full HOW TO CREATE A PAPER SHIRT    Entities: 'buttons': True 'folding lines': False 'paper': True 'shirt body': True 'shirt collar': True 'shirt sleeves': True Dependencies: 'Causes(folding lines, shirt body)': False 'Causes(folding lines, shirt collar)': False 'Causes(folding lines, shirt sleeves)': False 'Contains(paper, folding lines)': False 'Contains(shirt body, buttons)': True 1-GED: 0.59 Segments: 24 Readability: 1.00 MMMG: 0.59	
FLUX1-[pro] Paper    Entities: 'buttons': True 'folding lines': False 'paper': False 'shirt body': True 'shirt collar': True 'shirt sleeves': True Dependencies: 'Causes(folding lines, shirt body)': False 'Causes(folding lines, shirt collar)': False 'Causes(folding lines, shirt sleeves)': False 'Contains(paper, folding lines)': False 'Contains(shirt body, buttons)': True 1-GED: 0.62 Segments: 30 Readability: 1.00 MMMG: 0.62	
Ideogram V2    Entities: 'buttons': True 'folding lines': True 'paper': True 'shirt body': True 'shirt collar': True 'shirt sleeves': True Dependencies: 'Causes(folding lines, shirt body)': True 'Causes(folding lines, shirt collar)': True 'Causes(folding lines, shirt sleeves)': False 'Contains(paper, folding lines)': True 'Contains(shirt body, buttons)': True 1-GED: 0.95 Segments: 135 Readability: 0.28 MMMG: 0.26	
Infinity-8B PARONS PEE SHIRT    Entities: 'buttons': False 'folding lines': True 'paper': True 'shirt body': True 'shirt collar': True 'shirt sleeves': True Dependencies: 'Causes(folding lines, shirt body)': False 'Causes(folding lines, shirt collar)': False 'Causes(folding lines, shirt sleeves)': False 'Contains(paper, folding lines)': True 'Contains(shirt body, buttons)': False 1-GED: 0.59 Segments: 100 Readability: 0.67 MMMG: 0.39	
Seed-X    Entities: 'buttons': True 'folding lines': True 'paper': True 'shirt body': True 'shirt collar': True 'shirt sleeves': True Dependencies: 'Causes(folding lines, shirt body)': False 'Causes(folding lines, shirt collar)': False 'Causes(folding lines, shirt sleeves)': False 'Contains(paper, folding lines)': True 'Contains(shirt body, buttons)': True 1-GED: 0.84 Segments: 60 Readability: 1.00 MMMG: 0.84	

Figure 6: MMMG Benchmark visualization for seven representative models on a Preschool-Engineering example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.1.5 Geography

Question: Visualize an infographic depicting the different forms of precipitation and their characteristics.

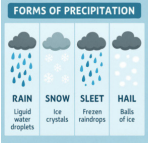
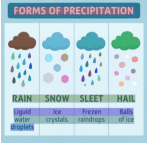
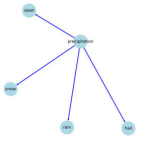
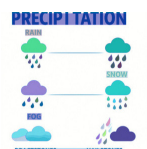
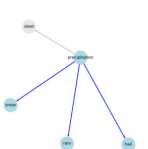
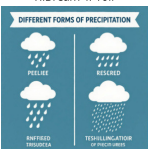
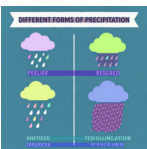
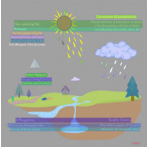
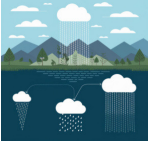
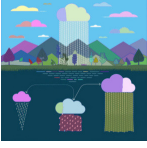
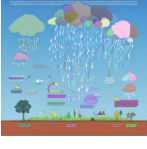
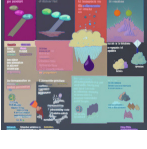
GPT-4o  	 Entities: 'Hail': True 'Precipitation': True 'Rain': True 'Sleet': True 'Snow': True Dependencies: 'Contains(Precipitation, Hail)': True 'Contains(Precipitation, Rain)': True 'Contains(Precipitation, Sleet)': True 'Contains(Precipitation, Snow)': True	1-GED: 1.00 Segments: 41 Readability: 1.00 MMMG: 1.00
FLUX-Reason (R1)  	 Entities: 'Hail': True 'Precipitation': True 'Rain': True 'Sleet': False 'Snow': True Dependencies: 'Contains(Precipitation, Hail)': True 'Contains(Precipitation, Rain)': True 'Contains(Precipitation, Sleet)': False 'Contains(Precipitation, Snow)': True	1-GED: 0.50 Segments: 43 Readability: 1.00 MMMG: 0.50
HiDream-11-full  	 Entities: 'Hail': False 'Precipitation': True 'Rain': True 'Sleet': False 'Snow': False Dependencies: 'Contains(Precipitation, Hail)': False 'Contains(Precipitation, Rain)': True 'Contains(Precipitation, Sleet)': False 'Contains(Precipitation, Snow)': False	1-GED: 0.33 Segments: 22 Readability: 1.00 MMMG: 0.33
FLUX1-[pro]  	 Entities: 'Hail': False 'Precipitation': True 'Rain': True 'Sleet': False 'Snow': False Dependencies: 'Contains(Precipitation, Hail)': False 'Contains(Precipitation, Rain)': True 'Contains(Precipitation, Sleet)': False 'Contains(Precipitation, Snow)': False	1-GED: 0.36 Segments: 27 Readability: 1.00 MMMG: 0.36
Ideogram V2  	 Entities: 'Hail': False 'Precipitation': True 'Rain': True 'Sleet': False 'Snow': False Dependencies: 'Contains(Precipitation, Hail)': False 'Contains(Precipitation, Rain)': True 'Contains(Precipitation, Sleet)': False 'Contains(Precipitation, Snow)': False	1-GED: 0.36 Segments: 69 Readability: 1.00 MMMG: 0.36
Infinity-8B  	 Entities: 'Hail': False 'Precipitation': True 'Rain': True 'Sleet': False 'Snow': False Dependencies: 'Contains(Precipitation, Hail)': False 'Contains(Precipitation, Rain)': True 'Contains(Precipitation, Sleet)': False 'Contains(Precipitation, Snow)': False	1-GED: 0.33 Segments: 204 Readability: 0.00 MMMG: 0.00
Seed-X  	 Entities: 'Hail': True 'Precipitation': True 'Rain': True 'Sleet': True 'Snow': True Dependencies: 'Contains(Precipitation, Hail)': True 'Contains(Precipitation, Rain)': True 'Contains(Precipitation, Sleet)': True 'Contains(Precipitation, Snow)': True	1-GED: 1.00 Segments: 83 Readability: 0.86 MMMG: 0.86

Figure 7: MMMG Benchmark visualization for seven representative models on a Preschool-Geography example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.1.6 Economics

Question: Visualize the key elements and dynamics of a grocery shopping experience in an informative infographic.

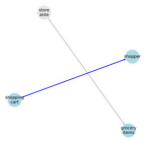
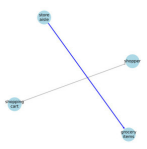
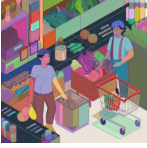
GPT-4o  		Entities: 'grocery items': True 'shopper': True 'shopping cart': True 'store aisle': False	Dependencies: 'Contains(store aisle, grocery items)': False 'Requires(shopper, shopping cart)': True	1-GED: 0.60 Segments: 41 Readability: 1.00 MMMG: 0.60
FLUX-Reason (R1) EMOTIONAL JOURNEY  		Entities: 'grocery items': True 'shopper': True 'shopping cart': True 'store aisle': True	Dependencies: 'Contains(store aisle, grocery items)': True 'Requires(shopper, shopping cart)': False	1-GED: 0.91 Segments: 127 Readability: 0.37 MMMG: 0.33
HiDream-11-full GROCERY SHOPPING  		Entities: 'grocery items': True 'shopper': False 'shopping cart': True 'store aisle': False	Dependencies: 'Contains(store aisle, grocery items)': False 'Requires(shopper, shopping cart)': False	1-GED: 0.50 Segments: 43 Readability: 1.00 MMMG: 0.50
FLUX1-[pro] SHAPPING WILD  		Entities: 'grocery items': True 'shopper': True 'shopping cart': True 'store aisle': False	Dependencies: 'Contains(store aisle, grocery items)': False 'Requires(shopper, shopping cart)': False	1-GED: 0.67 Segments: 87 Readability: 0.81 MMMG: 0.54
Ideogram V2  		Entities: 'grocery items': True 'shopper': True 'shopping cart': True 'store aisle': True	Dependencies: 'Contains(store aisle, grocery items)': True 'Requires(shopper, shopping cart)': False	1-GED: 0.91 Segments: 184 Readability: 0.00 MMMG: 0.00
Infinity-8B Grocery Shopping Shopping  		Entities: 'grocery items': True 'shopper': False 'shopping cart': True 'store aisle': False	Dependencies: 'Contains(store aisle, grocery items)': False 'Requires(shopper, shopping cart)': False	1-GED: 0.50 Segments: 143 Readability: 0.19 MMMG: 0.09
Seed-X Shopping grocery Shopping  		Entities: 'grocery items': True 'shopper': False 'shopping cart': False 'store aisle': False	Dependencies: 'Contains(store aisle, grocery items)': False 'Requires(shopper, shopping cart)': False	1-GED: 0.29 Segments: 103 Readability: 0.63 MMMG: 0.18

Figure 8: MMMG Benchmark visualization for seven representative models on a Preschool-Economics example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.1.7 Sociology

Question: Visualize an infographic depicting the meanings and functions of traffic light colors.

GPT-4o			Entities: "GO Command": True "Green Light": True "Red Light": True "STOP Command": True "WAIT Command": False "Yellow Light": True	Dependencies: "Causes(Green Light, GO Command)": True "Causes(Red Light, STOP Command)": True "Causes(Yellow Light, WAIT Command)": False	1-GED: 0.62 Segments: 14 Readability: 1.00 MMMG: 0.62
FLUX-Reason (R0)			Entities: "GO Command": True "Green Light": True "Red Light": True "STOP Command": True "WAIT Command": False "Yellow Light": True	Dependencies: "Causes(Green Light, GO Command)": True "Causes(Red Light, STOP Command)": True "Causes(Yellow Light, WAIT Command)": False	1-GED: 0.62 Segments: 27 Readability: 1.00 MMMG: 0.62
HiDream-11-full			Entities: "GO Command": False "Green Light": True "Red Light": False "STOP Command": False "WAIT Command": False "Yellow Light": True	Dependencies: "Causes(Green Light, GO Command)": False "Causes(Red Light, STOP Command)": False "Causes(Yellow Light, WAIT Command)": False	1-GED: 0.36 Segments: 39 Readability: 1.00 MMMG: 0.36
FLUX1-[pro]			Entities: "GO Command": False "Green Light": True "Red Light": True "STOP Command": False "WAIT Command": False "Yellow Light": True	Dependencies: "Causes(Green Light, GO Command)": False "Causes(Red Light, STOP Command)": False "Causes(Yellow Light, WAIT Command)": False	1-GED: 0.50 Segments: 9 Readability: 1.00 MMMG: 0.50
Ideogram V2			Entities: "GO Command": False "Green Light": True "Red Light": True "STOP Command": False "WAIT Command": False "Yellow Light": False	Dependencies: "Causes(Green Light, GO Command)": False "Causes(Red Light, STOP Command)": False "Causes(Yellow Light, WAIT Command)": False	1-GED: 0.36 Segments: 176 Readability: 0.00 MMMG: 0.00
Infinity-8B			Entities: "GO Command": False "Green Light": True "Red Light": True "STOP Command": False "WAIT Command": False "Yellow Light": True	Dependencies: "Causes(Green Light, GO Command)": False "Causes(Red Light, STOP Command)": False "Causes(Yellow Light, WAIT Command)": False	1-GED: 0.50 Segments: 94 Readability: 0.73 MMMG: 0.37
Seed-X			Entities: "GO Command": False "Green Light": True "Red Light": True "STOP Command": False "WAIT Command": False "Yellow Light": True	Dependencies: "Causes(Green Light, GO Command)": False "Causes(Red Light, STOP Command)": False "Causes(Yellow Light, WAIT Command)": False	1-GED: 0.50 Segments: 117 Readability: 0.48 MMMG: 0.24

Figure 9: MMMG Benchmark visualization for seven representative models on a Preschool-Sociology example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.1.8 History

Question: Visualize an educational infographic showcasing the key structural components of the Great Wall of China and their functions.

GPT-4o			Entities: 'Bigger rocks and stones': False 'Carriageway': True 'Great Wall': True 'Kilin-fired bricks': False 'Multi-function wall': False 'Ramparts': True 'Signal Beacons': True 'Surface of stone slabs and bricks': True 'Tamped layer of earth and rubble': False 'Towers': True ... (0 more)	Dependencies: 'Contains(Great Wall, Bigger rocks and stones)': False 'Contains(Great Wall, Carriageway)': True 'Contains(Great Wall, Kilin-fired bricks)': False 'Contains(Great Wall, Multi-function wall)': False 'Contains(Great Wall, Ramparts)': True 'Contains(Great Wall, Signal Beacons)': True 'Contains(Great Wall, Surface of stone slabs and bricks)': True 'Contains(Great Wall, Tamped layer of earth and rubble)': False 'Contains(Great Wall, Towers)': True 'Contains(Great Wall, Watchtowers)': True ... (0 more)	1-GED: 0.40 Segments: 50 Readability: 1.00 MMMG: 0.40
FLUX-Reason (R0)			Entities: 'Bigger rocks and stones': False 'Carriageway': True 'Great Wall': True 'Kilin-fired bricks': False 'Multi-function wall': False 'Ramparts': True 'Signal Beacons': False 'Surface of stone slabs and bricks': False 'Tamped layer of earth and rubble': False 'Towers': True ... (0 more)	Dependencies: 'Contains(Great Wall, Bigger rocks and stones)': False 'Contains(Great Wall, Carriageway)': True 'Contains(Great Wall, Kilin-fired bricks)': False 'Contains(Great Wall, Multi-function wall)': False 'Contains(Great Wall, Ramparts)': True 'Contains(Great Wall, Signal Beacons)': False 'Contains(Great Wall, Surface of stone slabs and bricks)': False 'Contains(Great Wall, Tamped layer of earth and rubble)': False 'Contains(Great Wall, Towers)': True 'Contains(Great Wall, Watchtowers)': True ... (0 more)	1-GED: 0.32 Segments: 32 Readability: 1.00 MMMG: 0.32
HiDream-11-full			Entities: 'Bigger rocks and stones': False 'Carriageway': True 'Great Wall': True 'Kilin-fired bricks': False 'Multi-function wall': False 'Ramparts': True 'Signal Beacons': False 'Surface of stone slabs and bricks': True 'Tamped layer of earth and rubble': False 'Towers': True ... (0 more)	Dependencies: 'Contains(Great Wall, Bigger rocks and stones)': False 'Contains(Great Wall, Carriageway)': True 'Contains(Great Wall, Kilin-fired bricks)': False 'Contains(Great Wall, Multi-function wall)': False 'Contains(Great Wall, Ramparts)': True 'Contains(Great Wall, Signal Beacons)': False 'Contains(Great Wall, Surface of stone slabs and bricks)': True 'Contains(Great Wall, Tamped layer of earth and rubble)': False 'Contains(Great Wall, Towers)': True 'Contains(Great Wall, Watchtowers)': True ... (0 more)	1-GED: 0.36 Segments: 53 Readability: 1.00 MMMG: 0.36
FLUX1-[pro]			Entities: 'Bigger rocks and stones': False 'Carriageway': True 'Great Wall': True 'Kilin-fired bricks': False 'Multi-function wall': False 'Ramparts': True 'Signal Beacons': False 'Surface of stone slabs and bricks': False 'Tamped layer of earth and rubble': False 'Towers': True ... (0 more)	Dependencies: 'Contains(Great Wall, Bigger rocks and stones)': False 'Contains(Great Wall, Carriageway)': True 'Contains(Great Wall, Kilin-fired bricks)': False 'Contains(Great Wall, Multi-function wall)': False 'Contains(Great Wall, Ramparts)': True 'Contains(Great Wall, Signal Beacons)': False 'Contains(Great Wall, Surface of stone slabs and bricks)': False 'Contains(Great Wall, Tamped layer of earth and rubble)': False 'Contains(Great Wall, Towers)': True 'Contains(Great Wall, Watchtowers)': True ... (0 more)	1-GED: 0.32 Segments: 23 Readability: 1.00 MMMG: 0.32
Ideogram V2			Entities: 'Bigger rocks and stones': False 'Carriageway': True 'Great Wall': True 'Kilin-fired bricks': False 'Multi-function wall': False 'Ramparts': True 'Signal Beacons': False 'Surface of stone slabs and bricks': True 'Tamped layer of earth and rubble': False 'Towers': True ... (0 more)	Dependencies: 'Contains(Great Wall, Bigger rocks and stones)': False 'Contains(Great Wall, Carriageway)': True 'Contains(Great Wall, Kilin-fired bricks)': False 'Contains(Great Wall, Multi-function wall)': False 'Contains(Great Wall, Ramparts)': True 'Contains(Great Wall, Signal Beacons)': False 'Contains(Great Wall, Surface of stone slabs and bricks)': True 'Contains(Great Wall, Tamped layer of earth and rubble)': False 'Contains(Great Wall, Towers)': True 'Contains(Great Wall, Watchtowers)': True ... (0 more)	1-GED: 0.36 Segments: 116 Readability: 0.49 MMMG: 0.18
Infinity-8B			Entities: 'Bigger rocks and stones': True 'Carriageway': True 'Great Wall': True 'Kilin-fired bricks': True 'Multi-function wall': False 'Ramparts': True 'Signal Beacons': True 'Surface of stone slabs and bricks': True 'Tamped layer of earth and rubble': True 'Towers': True ... (0 more)	Dependencies: 'Contains(Great Wall, Bigger rocks and stones)': True 'Contains(Great Wall, Carriageway)': True 'Contains(Great Wall, Kilin-fired bricks)': True 'Contains(Great Wall, Multi-function wall)': False 'Contains(Great Wall, Ramparts)': True 'Contains(Great Wall, Signal Beacons)': True 'Contains(Great Wall, Surface of stone slabs and bricks)': True 'Contains(Great Wall, Tamped layer of earth and rubble)': True 'Contains(Great Wall, Towers)': True 'Contains(Great Wall, Watchtowers)': True ... (0 more)	1-GED: 0.52 Segments: 141 Readability: 0.21 MMMG: 0.11
Seed-X			Entities: 'Bigger rocks and stones': False 'Carriageway': True 'Great Wall': True 'Kilin-fired bricks': True 'Multi-function wall': False 'Ramparts': True 'Signal Beacons': False 'Surface of stone slabs and bricks': True 'Tamped layer of earth and rubble': False 'Towers': True ... (0 more)	Dependencies: 'Contains(Great Wall, Bigger rocks and stones)': False 'Contains(Great Wall, Carriageway)': True 'Contains(Great Wall, Kilin-fired bricks)': True 'Contains(Great Wall, Multi-function wall)': False 'Contains(Great Wall, Ramparts)': True 'Contains(Great Wall, Signal Beacons)': False 'Contains(Great Wall, Surface of stone slabs and bricks)': True 'Contains(Great Wall, Tamped layer of earth and rubble)': False 'Contains(Great Wall, Towers)': True 'Contains(Great Wall, Watchtowers)': True ... (0 more)	1-GED: 0.40 Segments: 73 Readability: 0.97 MMMG: 0.39

Figure 10: MMMG Benchmark visualization for seven representative models on a Preschool-History example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.1.9 Literature

Question: Visualize an infographic of a treasure chest overflowing with various genres of children's books.

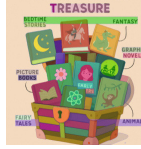
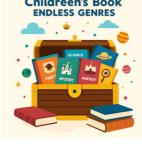
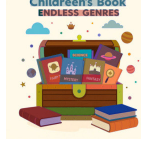
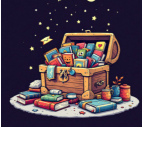
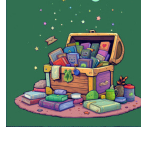
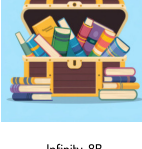
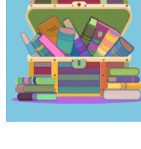
GPT-4o 			Entities: 'book covers': True 'children's books': True 'colorful illustrations': True 'genres': True 'treasure chest': True	Dependencies: 'Contains(children's books, book covers)': True 'Contains(children's books, colorful illustrations)': True 'Contains(treasure chest, children's books)': True 'Requires(children's books, genres)': False	1-GED: 0.94 Segments: 59 Readability: 1.00 MMMG: 0.94
FLUX-Reason (R1) 			Entities: 'book covers': True 'children's books': True 'colorful illustrations': True 'genres': True 'treasure chest': True	Dependencies: 'Contains(children's books, book covers)': True 'Contains(children's books, colorful illustrations)': False 'Contains(treasure chest, children's books)': True 'Requires(children's books, genres)': True	1-GED: 0.94 Segments: 70 Readability: 1.00 MMMG: 0.94
HiDream-11-full 			Entities: 'book covers': True 'children's books': True 'colorful illustrations': True 'genres': False 'treasure chest': True	Dependencies: 'Contains(children's books, book covers)': True 'Contains(children's books, colorful illustrations)': True 'Contains(treasure chest, children's books)': True 'Requires(children's books, genres)': False	1-GED: 0.62 Segments: 52 Readability: 1.00 MMMG: 0.62
FLUX1-[pro] 			Entities: 'book covers': True 'children's books': True 'colorful illustrations': True 'genres': False 'treasure chest': True	Dependencies: 'Contains(children's books, book covers)': True 'Contains(children's books, colorful illustrations)': True 'Contains(treasure chest, children's books)': True 'Requires(children's books, genres)': False	1-GED: 0.62 Segments: 73 Readability: 0.97 MMMG: 0.60
Ideogram V2 			Entities: 'book covers': True 'children's books': False 'colorful illustrations': False 'genres': False 'treasure chest': True	Dependencies: 'Contains(children's books, book covers)': False 'Contains(children's books, colorful illustrations)': False 'Contains(treasure chest, children's books)': False 'Requires(children's books, genres)': False	1-GED: 0.36 Segments: 81 Readability: 0.88 MMMG: 0.32
Infinity-8B 			Entities: 'book covers': True 'children's books': True 'colorful illustrations': True 'genres': False 'treasure chest': True	Dependencies: 'Contains(children's books, book covers)': True 'Contains(children's books, colorful illustrations)': True 'Contains(treasure chest, children's books)': True 'Requires(children's books, genres)': False	1-GED: 0.62 Segments: 156 Readability: 0.04 MMMG: 0.03
Seed-X 			Entities: 'book covers': True 'children's books': True 'colorful illustrations': True 'genres': False 'treasure chest': True	Dependencies: 'Contains(children's books, book covers)': True 'Contains(children's books, colorful illustrations)': True 'Contains(treasure chest, children's books)': True 'Requires(children's books, genres)': False	1-GED: 0.62 Segments: 127 Readability: 0.37 MMMG: 0.23

Figure 11: MMMG Benchmark visualization for seven representative models on a Preschool-Literature example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.2 Primary School

F.2.1 Biology

Question: Visualize an infographic comparing and contrasting radial and bilateral symmetry in biological organisms.

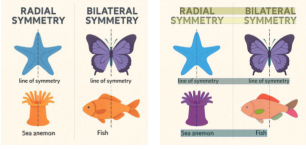
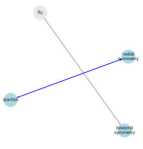
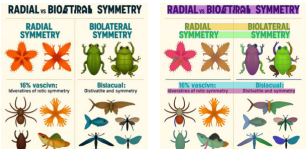
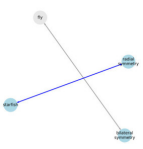
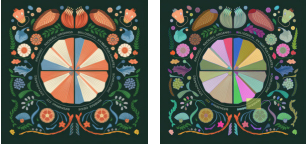
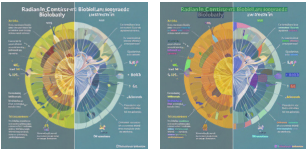
GPT-4o 		Entities: 'bilateral symmetry': True 'fly': False 'radial symmetry': True 'starfish': True	Dependencies: 'Definesbilateral symmetry, fly': False 'Definesradial symmetry, starfish': True	1-GED: 0.46 Segments: 14 Readability: 1.00 MMMG: 0.46
FLUX-Reason (R) 		Entities: 'bilateral symmetry': True 'fly': False 'radial symmetry': True 'starfish': True	Dependencies: 'Definesbilateral symmetry, fly': False 'Definesradial symmetry, starfish': True	1-GED: 0.46 Segments: 65 Readability: 1.00 MMMG: 0.46
HiDream-11-full 		Entities: 'bilateral symmetry': False 'fly': False 'radial symmetry': True 'starfish': True	Dependencies: 'Definesbilateral symmetry, fly': False 'Definesradial symmetry, starfish': True	1-GED: 0.33 Segments: 45 Readability: 1.00 MMMG: 0.33
FLUX1-[pro] 		Entities: 'bilateral symmetry': True 'fly': False 'radial symmetry': True 'starfish': False	Dependencies: 'Definesbilateral symmetry, fly': False 'Definesradial symmetry, starfish': False	1-GED: 0.40 Segments: 52 Readability: 1.00 MMMG: 0.40
Ideogram V2 		Entities: 'bilateral symmetry': True 'fly': False 'radial symmetry': True 'starfish': False	Dependencies: 'Definesbilateral symmetry, fly': False 'Definesradial symmetry, starfish': False	1-GED: 0.40 Segments: 154 Readability: 0.07 MMMG: 0.03
Infinity-8B 		Entities: 'bilateral symmetry': True 'fly': False 'radial symmetry': True 'starfish': False	Dependencies: 'Definesbilateral symmetry, fly': False 'Definesradial symmetry, starfish': False	1-GED: 0.40 Segments: 101 Readability: 0.66 MMMG: 0.26
Seed-X 		Entities: 'bilateral symmetry': True 'fly': False 'radial symmetry': True 'starfish': False	Dependencies: 'Definesbilateral symmetry, fly': False 'Definesradial symmetry, starfish': False	1-GED: 0.40 Segments: 84 Readability: 0.84 MMMG: 0.34

Figure 12: MMMG Benchmark visualization for seven representative models on a Primaryschool-Biology example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.2.2 Chemistry

Question: Create an infographic comparing the properties of metals and nonmetals, using simple icons for each.

GPT-4o			Entities: 'icon for metals': True 'icon for nonmetals': True 'metals': True 'nonmetals': True 'properties': False	Dependencies: 'Contains(properties, icon for metals)': False 'Contains(properties, icon for nonmetals)': False 'Defines(metals, properties)': True 'Defines(nonmetals, properties)': True 'Requires(icon for metals, metals)': True 'Requires(icon for nonmetals, nonmetals)': True	1-GED: 0.42 Segments: 23 Readability: 1.00 MMMG: 0.42
FLUX-Reason (R1)			Entities: 'icon for metals': True 'icon for nonmetals': True 'metals': True 'nonmetals': True 'properties': True	Dependencies: 'Contains(properties, icon for metals)': True 'Contains(properties, icon for nonmetals)': True 'Defines(metals, properties)': True 'Defines(nonmetals, properties)': True 'Requires(icon for metals, metals)': False 'Requires(icon for nonmetals, nonmetals)': False	1-GED: 0.92 Segments: 50 Readability: 1.00 MMMG: 0.92
HiDream-11-full			Entities: 'icon for metals': True 'icon for nonmetals': True 'metals': True 'nonmetals': True 'properties': True	Dependencies: 'Contains(properties, icon for metals)': False 'Contains(properties, icon for nonmetals)': False 'Defines(metals, properties)': True 'Defines(nonmetals, properties)': True 'Requires(icon for metals, metals)': False 'Requires(icon for nonmetals, nonmetals)': False	1-GED: 0.82 Segments: 26 Readability: 1.00 MMMG: 0.82
FLUX1-[pro]			Entities: 'icon for metals': True 'icon for nonmetals': True 'metals': True 'nonmetals': True 'properties': True	Dependencies: 'Contains(properties, icon for metals)': False 'Contains(properties, icon for nonmetals)': False 'Defines(metals, properties)': False 'Defines(nonmetals, properties)': False 'Requires(icon for metals, metals)': False 'Requires(icon for nonmetals, nonmetals)': False	1-GED: 0.56 Segments: 10 Readability: 1.00 MMMG: 0.56
Ideogram V2			Entities: 'icon for metals': True 'icon for nonmetals': False 'metals': True 'nonmetals': False 'properties': False	Dependencies: 'Contains(properties, icon for metals)': False 'Contains(properties, icon for nonmetals)': False 'Defines(metals, properties)': False 'Defines(nonmetals, properties)': False 'Requires(icon for metals, metals)': False 'Requires(icon for nonmetals, nonmetals)': False	1-GED: 0.27 Segments: 89 Readability: 0.79 MMMG: 0.21
Infinity-8B			Entities: 'icon for metals': True 'icon for nonmetals': True 'metals': True 'nonmetals': True 'properties': False	Dependencies: 'Contains(properties, icon for metals)': False 'Contains(properties, icon for nonmetals)': False 'Defines(metals, properties)': False 'Defines(nonmetals, properties)': False 'Requires(icon for metals, metals)': False 'Requires(icon for nonmetals, nonmetals)': False	1-GED: 0.47 Segments: 106 Readability: 0.60 MMMG: 0.28
Seed-X			Entities: 'icon for metals': True 'icon for nonmetals': False 'metals': True 'nonmetals': False 'properties': False	Dependencies: 'Contains(properties, icon for metals)': False 'Contains(properties, icon for nonmetals)': False 'Defines(metals, properties)': False 'Defines(nonmetals, properties)': False 'Requires(icon for metals, metals)': False 'Requires(icon for nonmetals, nonmetals)': False	1-GED: 0.27 Segments: 101 Readability: 0.66 MMMG: 0.17

Figure 13: MMMG Benchmark visualization for seven representative models on a Primaryschool-Chemistry example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.2.3 Mathematics

Question: Visualize the use of playdough and toothpicks to create and understand 3D shapes.

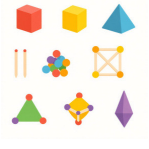
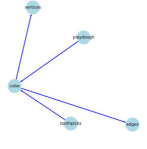
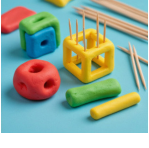
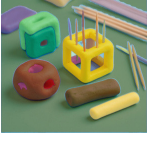
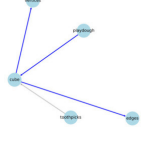
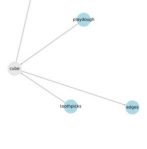
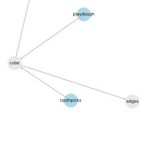
GPT-4o				Entities: 'cube': True 'edges': True 'playdough': True 'toothpicks': True 'vertices': True	Dependencies: 'Contains(cube, edges)': True 'Contains(cube, vertices)': True 'Requires(cube, playdough)': True 'Requires(cube, toothpicks)': True	1-GED: 1.00 Segments: 41 Readability: 1.00 MMMG: 1.00
FLUX-Reason (R1)				Entities: 'cube': True 'edges': True 'playdough': True 'toothpicks': True 'vertices': True	Dependencies: 'Contains(cube, edges)': True 'Contains(cube, vertices)': True 'Requires(cube, playdough)': True 'Requires(cube, toothpicks)': True	1-GED: 1.00 Segments: 53 Readability: 1.00 MMMG: 1.00
HiDream-11-full				Entities: 'cube': True 'edges': True 'playdough': True 'toothpicks': True 'vertices': True	Dependencies: 'Contains(cube, edges)': True 'Contains(cube, vertices)': True 'Requires(cube, playdough)': True 'Requires(cube, toothpicks)': False	1-GED: 0.94 Segments: 34 Readability: 1.00 MMMG: 0.94
FLUX1-[pro]				Entities: 'cube': True 'edges': True 'playdough': True 'toothpicks': True 'vertices': False	Dependencies: 'Contains(cube, edges)': False 'Contains(cube, vertices)': False 'Requires(cube, playdough)': False 'Requires(cube, toothpicks)': False	1-GED: 0.62 Segments: 29 Readability: 1.00 MMMG: 0.62
Ideogram V2				Entities: 'cube': False 'edges': True 'playdough': True 'toothpicks': True 'vertices': True	Dependencies: 'Contains(cube, edges)': False 'Contains(cube, vertices)': False 'Requires(cube, playdough)': False 'Requires(cube, toothpicks)': False	1-GED: 0.62 Segments: 102 Readability: 0.64 MMMG: 0.40
Infinity-8B				Entities: 'cube': False 'edges': False 'playdough': True 'toothpicks': True 'vertices': False	Dependencies: 'Contains(cube, edges)': False 'Contains(cube, vertices)': False 'Requires(cube, playdough)': False 'Requires(cube, toothpicks)': False	1-GED: 0.36 Segments: 81 Readability: 0.88 MMMG: 0.32
Seed-X				Entities: 'cube': False 'edges': False 'playdough': False 'toothpicks': False 'vertices': False	Dependencies: 'Contains(cube, edges)': False 'Contains(cube, vertices)': False 'Requires(cube, playdough)': False 'Requires(cube, toothpicks)': False	1-GED: 0.00 Segments: 44 Readability: 1.00 MMMG: 0.00

Figure 14: MMMG Benchmark visualization for seven representative models on a Primaryschool-Mathematics example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.2.4 Engineering

Question: Visualize an educational poster demonstrating the interaction between permanent magnets and a steel bar, highlighting forces, alignments, and magnetic field representations.

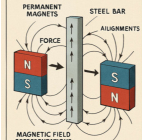
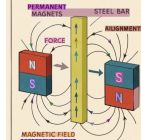
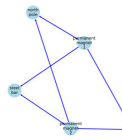
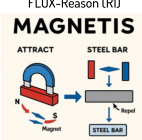
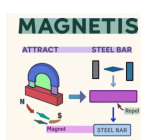
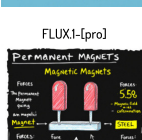
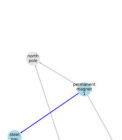
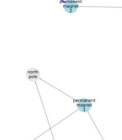
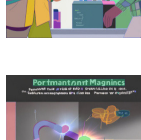
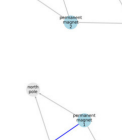
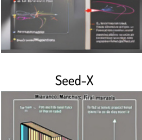
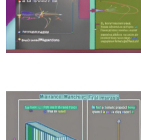
GPT-4o 			Entities: 'North Pole': True 'Permanent Magnet 1': True 'Permanent Magnet 2': True 'South Pole': True 'Steel Bar': True	Dependencies: 'Causes(Permanent Magnet 1, Steel Bar)': True 'Causes(Permanent Magnet 2, Steel Bar)': True 'Contains(Permanent Magnet 1, North Pole)': True 'Contains(Permanent Magnet 1, South Pole)': True 'Contains(Permanent Magnet 2, North Pole)': True 'Contains(Permanent Magnet 2, South Pole)': True	1-GED: 1.00 Segments: 29 Readability: 1.00 MMM: 1.00
FLUX-Reason (R) 			Entities: 'North Pole': True 'Permanent Magnet 1': True 'Permanent Magnet 2': True 'South Pole': True 'Steel Bar': True	Dependencies: 'Causes(Permanent Magnet 1, Steel Bar)': True 'Causes(Permanent Magnet 2, Steel Bar)': True 'Contains(Permanent Magnet 1, North Pole)': True 'Contains(Permanent Magnet 1, South Pole)': True 'Contains(Permanent Magnet 2, North Pole)': True 'Contains(Permanent Magnet 2, South Pole)': False	1-GED: 0.90 Segments: 31 Readability: 1.00 MMM: 0.90
HiDream-11-full 			Entities: 'North Pole': False 'Permanent Magnet 1': True 'Permanent Magnet 2': False 'South Pole': False 'Steel Bar': True	Dependencies: 'Causes(Permanent Magnet 1, Steel Bar)': True 'Causes(Permanent Magnet 2, Steel Bar)': False 'Contains(Permanent Magnet 1, North Pole)': False 'Contains(Permanent Magnet 1, South Pole)': False 'Contains(Permanent Magnet 2, North Pole)': False 'Contains(Permanent Magnet 2, South Pole)': False	1-GED: 0.29 Segments: 19 Readability: 1.00 MMM: 0.29
FLUX-1-pro 			Entities: 'North Pole': False 'Permanent Magnet 1': True 'Permanent Magnet 2': True 'South Pole': False 'Steel Bar': True	Dependencies: 'Causes(Permanent Magnet 1, Steel Bar)': True 'Causes(Permanent Magnet 2, Steel Bar)': True 'Contains(Permanent Magnet 1, North Pole)': False 'Contains(Permanent Magnet 1, South Pole)': False 'Contains(Permanent Magnet 2, North Pole)': False 'Contains(Permanent Magnet 2, South Pole)': False	1-GED: 0.50 Segments: 25 Readability: 1.00 MMM: 0.50
Ideogram V2 			Entities: 'North Pole': False 'Permanent Magnet 1': True 'Permanent Magnet 2': True 'South Pole': False 'Steel Bar': False	Dependencies: 'Causes(Permanent Magnet 1, Steel Bar)': False 'Causes(Permanent Magnet 2, Steel Bar)': False 'Contains(Permanent Magnet 1, North Pole)': False 'Contains(Permanent Magnet 1, South Pole)': False 'Contains(Permanent Magnet 2, North Pole)': False 'Contains(Permanent Magnet 2, South Pole)': False	1-GED: 0.31 Segments: 132 Readability: 0.31 MMM: 0.10
Infinity-BB 			Entities: 'North Pole': False 'Permanent Magnet 1': True 'Permanent Magnet 2': True 'South Pole': False 'Steel Bar': True	Dependencies: 'Causes(Permanent Magnet 1, Steel Bar)': True 'Causes(Permanent Magnet 2, Steel Bar)': True 'Contains(Permanent Magnet 1, North Pole)': False 'Contains(Permanent Magnet 1, South Pole)': False 'Contains(Permanent Magnet 2, North Pole)': False 'Contains(Permanent Magnet 2, South Pole)': False	1-GED: 0.50 Segments: 57 Readability: 1.00 MMM: 0.50
Seed-X 			Entities: 'North Pole': False 'Permanent Magnet 1': False 'Permanent Magnet 2': False 'South Pole': False 'Steel Bar': False	Dependencies: 'Causes(Permanent Magnet 1, Steel Bar)': False 'Causes(Permanent Magnet 2, Steel Bar)': False 'Contains(Permanent Magnet 1, North Pole)': False 'Contains(Permanent Magnet 1, South Pole)': False 'Contains(Permanent Magnet 2, North Pole)': False 'Contains(Permanent Magnet 2, South Pole)': False	1-GED: 0.00 Segments: 68 Readability: 1.00 MMM: 0.00

Figure 15: MMM Benchmark visualization for seven representative models on a Primaryschool-Engineering example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMM-Score along with its component sub-scores.

F.2.5 Geography

Question: Visualize the processes of weathering, erosion, and deposition in a cohesive manner.

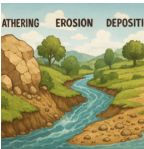
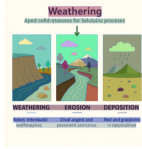
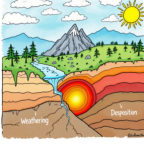
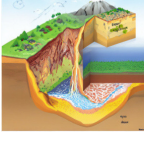
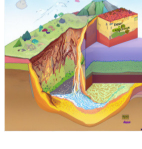
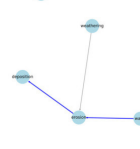
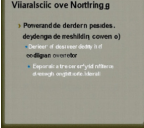
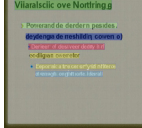
GPT-4o 			Entities: "Deposition": True "Erosion": True "Sediment": True "Water": True "Weathering": True	Dependencies: "Causes(Erosion, Deposition)": True "Causes(Weathering, Erosion)": False "Requires(Erosion, Water)": True	1-GED: 0.93 Segments: 64 Readability: 1.00 MMMG: 0.93
FLUX-Reason (R0) 			Entities: "Deposition": True "Erosion": True "Sediment": False "Water": True "Weathering": True	Dependencies: "Causes(Erosion, Deposition)": True "Causes(Weathering, Erosion)": True "Requires(Erosion, Water)": False	1-GED: 0.86 Segments: 56 Readability: 1.00 MMMG: 0.86
HiDream-11-full 			Entities: "Deposition": False "Erosion": True "Sediment": True "Water": True "Weathering": False	Dependencies: "Causes(Erosion, Deposition)": False "Causes(Weathering, Erosion)": False "Requires(Erosion, Water)": False	1-GED: 0.55 Segments: 92 Readability: 0.76 MMMG: 0.41
FLUX1-[pro] 			Entities: "Deposition": True "Erosion": False "Sediment": True "Water": True "Weathering": True	Dependencies: "Causes(Erosion, Deposition)": False "Causes(Weathering, Erosion)": False "Requires(Erosion, Water)": False	1-GED: 0.67 Segments: 58 Readability: 1.00 MMMG: 0.67
Ideogram V2 			Entities: "Deposition": False "Erosion": True "Sediment": False "Water": True "Weathering": False	Dependencies: "Causes(Erosion, Deposition)": False "Causes(Weathering, Erosion)": False "Requires(Erosion, Water)": True	1-GED: 0.55 Segments: 53 Readability: 1.00 MMMG: 0.55
Infinity-8B 			Entities: "Deposition": True "Erosion": True "Sediment": True "Water": True "Weathering": True	Dependencies: "Causes(Erosion, Deposition)": True "Causes(Weathering, Erosion)": False "Requires(Erosion, Water)": True	1-GED: 0.93 Segments: 61 Readability: 1.00 MMMG: 0.93
Seed-X 			Entities: "Deposition": False "Erosion": False "Sediment": False "Water": False "Weathering": False	Dependencies: "Causes(Erosion, Deposition)": False "Causes(Weathering, Erosion)": False "Requires(Erosion, Water)": False	1-GED: 0.00 Segments: 24 Readability: 1.00 MMMG: 0.00

Figure 16: MMMG Benchmark visualization for seven representative models on a Primaryschool-Geography example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.2.6 Economics

Question: Visualize an infographic illustrating the concepts of saving and spending in a comparative manner.

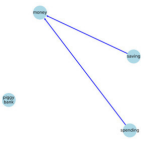
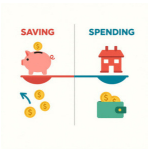
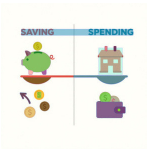
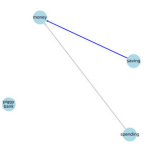
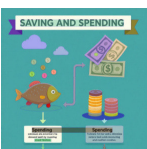
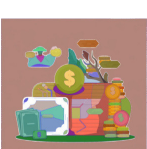
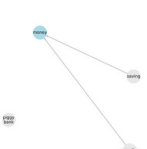
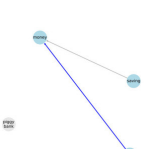
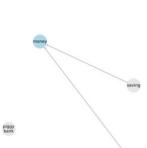
GPT-4o				Entities: "Money": True "Piggy Bank": True "Saving": True "Spending": True	Dependencies: "Entails(Saving, change(Money))": True "Entails(Spending, change(Money))": True	1-GED: 1.00 Segments: 18 Readability: 1.00 MMM-G: 1.00
FLUX-Reason (R1)				Entities: "Money": True "Piggy Bank": True "Saving": True "Spending": True	Dependencies: "Entails(Saving, change(Money))": True "Entails(Spending, change(Money))": False	1-GED: 0.91 Segments: 25 Readability: 1.00 MMM-G: 0.91
HiDream-11-full				Entities: "Money": True "Piggy Bank": False "Saving": True "Spending": True	Dependencies: "Entails(Saving, change(Money))": False "Entails(Spending, change(Money))": True	1-GED: 0.60 Segments: 42 Readability: 1.00 MMM-G: 0.60
FLUX1-[pro]				Entities: "Money": True "Piggy Bank": False "Saving": False "Spending": False	Dependencies: "Entails(Saving, change(Money))": False "Entails(Spending, change(Money))": False	1-GED: 0.29 Segments: 73 Readability: 0.97 MMM-G: 0.28
Ideogram V2				Entities: "Money": True "Piggy Bank": False "Saving": False "Spending": False	Dependencies: "Entails(Saving, change(Money))": False "Entails(Spending, change(Money))": False	1-GED: 0.29 Segments: 80 Readability: 0.89 MMM-G: 0.25
Infinity-8B				Entities: "Money": True "Piggy Bank": False "Saving": True "Spending": True	Dependencies: "Entails(Saving, change(Money))": False "Entails(Spending, change(Money))": True	1-GED: 0.60 Segments: 93 Readability: 0.74 MMM-G: 0.45
Seed-X				Entities: "Money": True "Piggy Bank": False "Saving": False "Spending": False	Dependencies: "Entails(Saving, change(Money))": False "Entails(Spending, change(Money))": False	1-GED: 0.29 Segments: 93 Readability: 0.74 MMM-G: 0.21

Figure 17: MMMG Benchmark visualization for seven representative models on a Primaryschool-Economics example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.2.7 Sociology

Question: Visualize an educational poster outlining the differences between nuclear and extended families.

GPT-4o			Entities: 'adult': True 'child': True 'extended family': True 'nuclear family': True	Dependencies: 'Contains(extended family, adult)': True 'Contains(extended family, child)': True 'Contains(nuclear family, adult)': True 'Contains(nuclear family, child)': True	1-GED: 1.00 Segments: 36 Readability: 1.00 MMMG: 1.00
FLUX-Reason (R1)			Entities: 'adult': True 'child': True 'extended family': True 'nuclear family': True	Dependencies: 'Contains(extended family, adult)': True 'Contains(extended family, child)': True 'Contains(nuclear family, adult)': True 'Contains(nuclear family, child)': True	1-GED: 1.00 Segments: 102 Readability: 0.64 MMMG: 0.64
HiDream-11-full			Entities: 'adult': True 'child': True 'extended family': True 'nuclear family': True	Dependencies: 'Contains(extended family, adult)': True 'Contains(extended family, child)': True 'Contains(nuclear family, adult)': True 'Contains(nuclear family, child)': True	1-GED: 1.00 Segments: 86 Readability: 0.82 MMMG: 0.82
FLUX1-[pro]			Entities: 'adult': True 'child': True 'extended family': False 'nuclear family': False	Dependencies: 'Contains(extended family, adult)': False 'Contains(extended family, child)': False 'Contains(nuclear family, adult)': False 'Contains(nuclear family, child)': False	1-GED: 0.40 Segments: 36 Readability: 1.00 MMMG: 0.40
Ideogram V2			Entities: 'adult': True 'child': True 'extended family': False 'nuclear family': True	Dependencies: 'Contains(extended family, adult)': False 'Contains(extended family, child)': False 'Contains(nuclear family, adult)': True 'Contains(nuclear family, child)': True	1-GED: 0.46 Segments: 173 Readability: 0.00 MMMG: 0.00
Infinity-8B			Entities: 'adult': True 'child': True 'extended family': True 'nuclear family': True	Dependencies: 'Contains(extended family, adult)': True 'Contains(extended family, child)': True 'Contains(nuclear family, adult)': True 'Contains(nuclear family, child)': True	1-GED: 1.00 Segments: 109 Readability: 0.57 MMMG: 0.57
Seed-X			Entities: 'adult': True 'child': True 'extended family': False 'nuclear family': True	Dependencies: 'Contains(extended family, adult)': False 'Contains(extended family, child)': False 'Contains(nuclear family, adult)': True 'Contains(nuclear family, child)': True	1-GED: 0.46 Segments: 68 Readability: 1.00 MMMG: 0.46

Figure 18: MMMG Benchmark visualization for seven representative models on a Primaryschool-Sociology example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.2.8 History

Question: Visualize the contrasting concepts of Freedom and Slavery in a historical context through an educational poster.

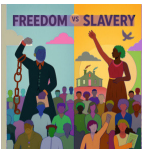
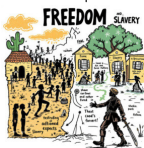
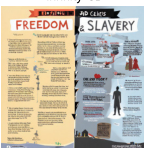
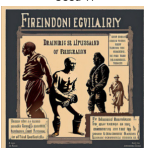
GPT-4o				Entities: 'Crown': False 'Figures': True 'Flag': True 'Freedom': True 'Slavery': True	Dependencies: 'Contains(Freedom, Figures)': False 'Entails(Freedom, Slavery)': False 'Requires(Slavery, Crown)': False	1-GED: 0.67 Segments: 18 Readability: 1.00 MMMG: 0.67
FLUX-Reason (R0)				Entities: 'Crown': False 'Figures': True 'Flag': False 'Freedom': True 'Slavery': True	Dependencies: 'Contains(Freedom, Figures)': True 'Entails(Freedom, Slavery)': False 'Requires(Slavery, Crown)': False	1-GED: 0.50 Segments: 132 Readability: 0.31 MMMG: 0.16
HiDream-11-full				Entities: 'Crown': False 'Figures': True 'Flag': False 'Freedom': True 'Slavery': True	Dependencies: 'Contains(Freedom, Figures)': False 'Entails(Freedom, Slavery)': False 'Requires(Slavery, Crown)': False	1-GED: 0.55 Segments: 42 Readability: 1.00 MMMG: 0.55
FLUX1-[pro]				Entities: 'Crown': False 'Figures': True 'Flag': False 'Freedom': True 'Slavery': True	Dependencies: 'Contains(Freedom, Figures)': True 'Entails(Freedom, Slavery)': False 'Requires(Slavery, Crown)': False	1-GED: 0.50 Segments: 103 Readability: 0.63 MMMG: 0.32
Ideogram V2				Entities: 'Crown': False 'Figures': True 'Flag': True 'Freedom': True 'Slavery': True	Dependencies: 'Contains(Freedom, Figures)': True 'Entails(Freedom, Slavery)': False 'Requires(Slavery, Crown)': False	1-GED: 0.62 Segments: 167 Readability: 0.00 MMMG: 0.00
Infinity-8B				Entities: 'Crown': False 'Figures': True 'Flag': False 'Freedom': True 'Slavery': True	Dependencies: 'Contains(Freedom, Figures)': False 'Entails(Freedom, Slavery)': False 'Requires(Slavery, Crown)': False	1-GED: 0.55 Segments: 115 Readability: 0.50 MMMG: 0.27
Seed-X				Entities: 'Crown': False 'Figures': True 'Flag': False 'Freedom': False 'Slavery': True	Dependencies: 'Contains(Freedom, Figures)': False 'Entails(Freedom, Slavery)': False 'Requires(Slavery, Crown)': False	1-GED: 0.40 Segments: 50 Readability: 1.00 MMMG: 0.40

Figure 19: MMMG Benchmark visualization for seven representative models on a Primaryschool-History example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.2.9 Philosophy

Question: Visualize a diagram that depicts the concept of "community," illustrating different roles people play in it.

GPT-4o			Entities: 'community': True 'diversity': True 'individuals': True 'interactions': False 'roles': True 'support': False	Dependencies: 'Causes(interactions, support)': False 'Contains(community, diversity)': True 'Contains(community, individuals)': True 'Defines(individuals, roles)': True 'Requires(roles, interactions)': False	I-GED: 0.60 Segments: 26 Readability: 1.00 MMM-G: 0.60
FLUX-Reason (R0) Community			Entities: 'community': True 'diversity': True 'individuals': True 'interactions': False 'roles': True 'support': False	Dependencies: 'Causes(interactions, support)': False 'Contains(community, diversity)': True 'Contains(community, individuals)': True 'Defines(individuals, roles)': True 'Requires(roles, interactions)': False	I-GED: 0.60 Segments: 67 Readability: 1.00 MMM-G: 0.60
HiDream-11-full COMMUNITY			Entities: 'community': True 'diversity': True 'individuals': True 'interactions': False 'roles': True 'support': False	Dependencies: 'Causes(interactions, support)': False 'Contains(community, diversity)': True 'Contains(community, individuals)': True 'Defines(individuals, roles)': False 'Requires(roles, interactions)': False	I-GED: 0.47 Segments: 27 Readability: 1.00 MMM-G: 0.47
FLUX1-[pro]			Entities: 'community': True 'diversity': False 'individuals': True 'interactions': False 'roles': True 'support': False	Dependencies: 'Causes(interactions, support)': False 'Contains(community, diversity)': False 'Contains(community, individuals)': True 'Defines(individuals, roles)': False 'Requires(roles, interactions)': False	I-GED: 0.38 Segments: 24 Readability: 1.00 MMM-G: 0.38
Ideogram V2 COMMUNITY			Entities: 'community': True 'diversity': True 'individuals': True 'interactions': True 'roles': True 'support': False	Dependencies: 'Causes(interactions, support)': False 'Contains(community, diversity)': True 'Contains(community, individuals)': True 'Defines(individuals, roles)': False 'Requires(roles, interactions)': False	I-GED: 0.53 Segments: 120 Readability: 0.44 MMM-G: 0.23
Infinity-8B			Entities: 'community': True 'diversity': True 'individuals': True 'interactions': True 'roles': False 'support': True	Dependencies: 'Causes(interactions, support)': False 'Contains(community, diversity)': False 'Contains(community, individuals)': True 'Defines(individuals, roles)': False 'Requires(roles, interactions)': False	I-GED: 0.59 Segments: 109 Readability: 0.57 MMM-G: 0.33
Seed-X			Entities: 'community': True 'diversity': True 'individuals': True 'interactions': True 'roles': False 'support': False	Dependencies: 'Causes(interactions, support)': False 'Contains(community, diversity)': True 'Contains(community, individuals)': True 'Defines(individuals, roles)': False 'Requires(roles, interactions)': False	I-GED: 0.44 Segments: 67 Readability: 1.00 MMM-G: 0.44

Figure 20: MMMG Benchmark visualization for seven representative models on a Primaryschool-Philosophy example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.2.10 Literature

Question: Design a poster that teaches kids how to write a simple story, incorporating steps and illustrations.

GPT-4o			Entities: 'characters': True 'conflict': True 'illustrations': True 'plot': False 'resolution': True 'setting': True 'steps': True 'story structure': True	Dependencies: 'Contains(story structure, characters)': True 'Contains(story structure, plot)': False 'Contains(story structure, setting)': True	1-GED: 0.70 Segments: 32 Readability: 1.00 MMMG: 0.70
FLUX-Reason (R1)			Entities: 'characters': True 'conflict': False 'illustrations': True 'plot': False 'resolution': False 'setting': True 'steps': True 'story structure': True	Dependencies: 'Contains(story structure, characters)': True 'Contains(story structure, plot)': False 'Contains(story structure, setting)': True	1-GED: 0.56 Segments: 19 Readability: 1.00 MMMG: 0.56
HiDream-11-full			Entities: 'characters': True 'conflict': False 'illustrations': True 'plot': False 'resolution': False 'setting': False 'steps': True 'story structure': False	Dependencies: 'Contains(story structure, characters)': False 'Contains(story structure, plot)': False 'Contains(story structure, setting)': False	1-GED: 0.43 Segments: 61 Readability: 1.00 MMMG: 0.43
FLUX1-[pro]			Entities: 'characters': True 'conflict': False 'illustrations': True 'plot': False 'resolution': False 'setting': True 'steps': False 'story structure': False	Dependencies: 'Contains(story structure, characters)': False 'Contains(story structure, plot)': False 'Contains(story structure, setting)': False	1-GED: 0.43 Segments: 41 Readability: 1.00 MMMG: 0.43
Ideogram V2			Entities: 'characters': False 'conflict': False 'illustrations': True 'plot': False 'resolution': False 'setting': False 'steps': False 'story structure': False	Dependencies: 'Contains(story structure, characters)': False 'Contains(story structure, plot)': False 'Contains(story structure, setting)': False	1-GED: 0.17 Segments: 139 Readability: 0.23 MMMG: 0.04
Infinity-8B			Entities: 'characters': True 'conflict': False 'illustrations': True 'plot': False 'resolution': False 'setting': False 'steps': True 'story structure': False	Dependencies: 'Contains(story structure, characters)': False 'Contains(story structure, plot)': False 'Contains(story structure, setting)': False	1-GED: 0.43 Segments: 118 Readability: 0.47 MMMG: 0.20
Seed-X			Entities: 'characters': True 'conflict': False 'illustrations': True 'plot': False 'resolution': False 'setting': True 'steps': False 'story structure': False	Dependencies: 'Contains(story structure, characters)': False 'Contains(story structure, plot)': False 'Contains(story structure, setting)': False	1-GED: 0.43 Segments: 101 Readability: 0.86 MMMG: 0.28

Figure 21: MMMG Benchmark visualization for seven representative models on a Primaryschool-Literature example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.3 Secondary School

F.3.1 Biology

Question: Visualize an infographic illustrating the four main types of biomolecules and their structures.

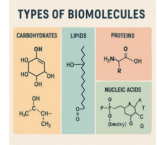
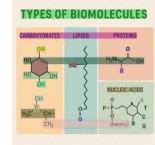
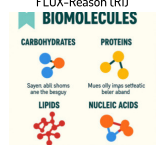
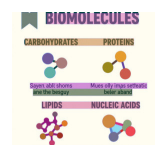
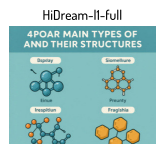
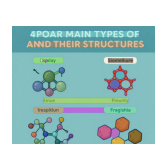
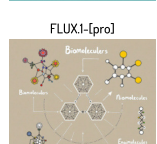
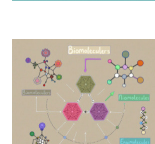
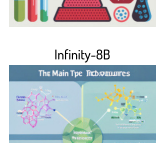
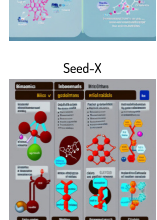
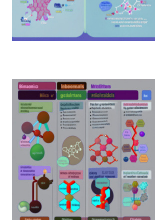
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FLUX-Reason (R) 			Entities: "Carbohydrates": True "Lipids": True "Nucleic Acids": True "Proteins": True	Dependencies:	1-GED: 1.00 Segments: 32 Readability: 1.00 MMMG: 1.00
HiDream-It-full 			Entities: "Carbohydrates": False "Lipids": False "Nucleic Acids": False "Proteins": False	Dependencies:	1-GED: 0.00 Segments: 50 Readability: 1.00 MMMG: 0.00
FLUX1-prol 			Entities: "Carbohydrates": False "Lipids": False "Nucleic Acids": False "Proteins": False	Dependencies:	1-GED: 0.00 Segments: 38 Readability: 1.00 MMMG: 0.00
Ideogram V2 			Entities: "Carbohydrates": False "Lipids": False "Nucleic Acids": True "Proteins": False	Dependencies:	1-GED: 0.40 Segments: 152 Readability: 0.09 MMMG: 0.04
Infinity-8B 			Entities: "Carbohydrates": False "Lipids": False "Nucleic Acids": False "Proteins": False	Dependencies:	1-GED: 0.00 Segments: 100 Readability: 0.67 MMMG: 0.00
Seed-X 			Entities: "Carbohydrates": True "Lipids": True "Nucleic Acids": True "Proteins": True	Dependencies:	1-GED: 1.00 Segments: 87 Readability: 0.81 MMMG: 0.81

Figure 22: MMMG Benchmark visualization for seven representative models on a Secondaryschool-Biology example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.3.2 Chemistry

Question: Visualize the states of matter and their molecular arrangements in an educational poster.

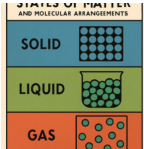
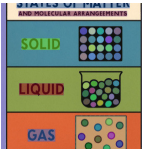
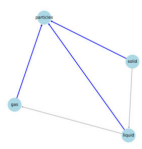
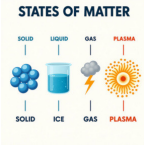
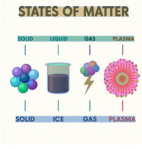
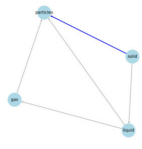
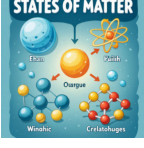
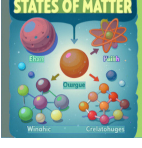
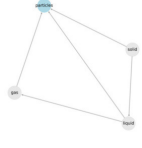
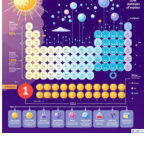
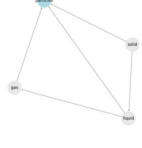
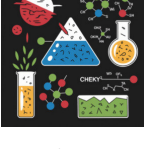
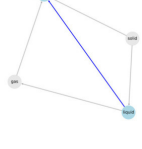
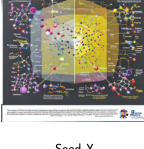
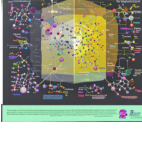
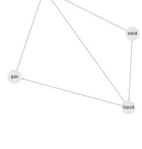
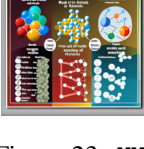
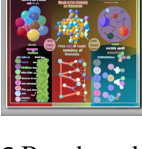
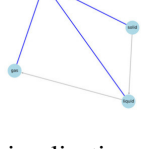
GPT-4o 			Entities: 'gas': True 'liquid': True 'particles': True 'solid': True	Dependencies: 'Contains(gas, particles)': True 'Contains(liquid, particles)': True 'Contains(solid, particles)': True 'TemporalOrder(liquid, gas)': False 'TemporalOrder(solid, liquid)': False	1-GED: 0.88 Segments: 55 Readability: 1.00 MMMG: 0.88
FLUX-Reason (R1) 			Entities: 'gas': True 'liquid': True 'particles': True 'solid': True	Dependencies: 'Contains(gas, particles)': False 'Contains(liquid, particles)': False 'Contains(solid, particles)': True 'TemporalOrder(liquid, gas)': False 'TemporalOrder(solid, liquid)': False	1-GED: 0.71 Segments: 53 Readability: 1.00 MMMG: 0.71
HiDream-11-full 			Entities: 'gas': False 'liquid': False 'particles': True 'solid': False	Dependencies: 'Contains(gas, particles)': False 'Contains(liquid, particles)': False 'Contains(solid, particles)': True 'TemporalOrder(liquid, gas)': False 'TemporalOrder(solid, liquid)': False	1-GED: 0.20 Segments: 83 Readability: 0.86 MMMG: 0.17
FLUX1-[pro] 			Entities: 'gas': False 'liquid': False 'particles': True 'solid': False	Dependencies: 'Contains(gas, particles)': False 'Contains(liquid, particles)': False 'Contains(solid, particles)': True 'TemporalOrder(liquid, gas)': False 'TemporalOrder(solid, liquid)': False	1-GED: 0.20 Segments: 178 Readability: 0.00 MMMG: 0.00
Ideogram V2 			Entities: 'gas': False 'liquid': True 'particles': True 'solid': False	Dependencies: 'Contains(gas, particles)': False 'Contains(liquid, particles)': True 'Contains(solid, particles)': False 'TemporalOrder(liquid, gas)': False 'TemporalOrder(solid, liquid)': False	1-GED: 0.33 Segments: 102 Readability: 0.64 MMMG: 0.21
Infinity-8B 			Entities: 'gas': False 'liquid': False 'particles': True 'solid': False	Dependencies: 'Contains(gas, particles)': False 'Contains(liquid, particles)': False 'Contains(solid, particles)': True 'TemporalOrder(liquid, gas)': False 'TemporalOrder(solid, liquid)': False	1-GED: 0.20 Segments: 162 Readability: 0.00 MMMG: 0.00
Seed-X 			Entities: 'gas': True 'liquid': True 'particles': True 'solid': True	Dependencies: 'Contains(gas, particles)': True 'Contains(liquid, particles)': True 'Contains(solid, particles)': True 'TemporalOrder(liquid, gas)': False 'TemporalOrder(solid, liquid)': False	1-GED: 0.88 Segments: 130 Readability: 0.33 MMMG: 0.29

Figure 23: MMMG Benchmark visualization for seven representative models on a Secondaryschool-Chemistry example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.3.3 Mathematics

Question: Create a diagram explaining the difference between rational and irrational numbers, including examples and visual representations.

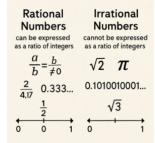
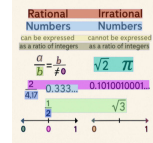
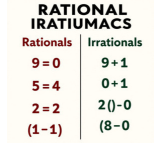
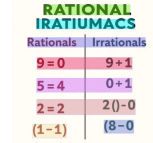
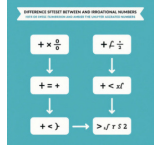
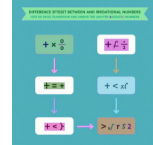
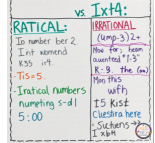
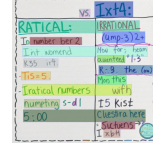
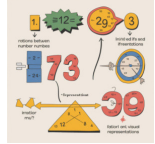
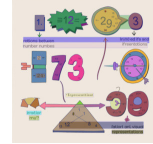
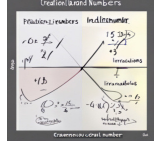
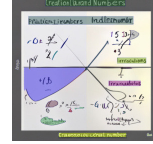
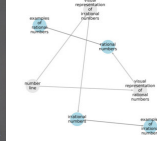
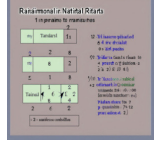
GPT-4o 			Entities: - Examples of Irrational Numbers: True - Examples of Rational Numbers: True - Irrational Numbers: True - Number Line: True - Rational Numbers: True - Visual Representation of Irrational Numbers: True - Visual Representation of Rational Numbers: True	Dependencies: - Contains(Number Line, Visual Representation of Irrational Numbers): True - Contains(Number Line, Visual Representation of Rational Numbers): True - Defines(Irrational Numbers, Examples of Irrational Numbers): True - Defines(Rational Numbers, Examples of Rational Numbers): True - Entails(Visual Representation of Irrational Numbers, Irrational Numbers): True - Entails(Visual Representation of Rational Numbers, Rational Numbers): True	1-GED: 1.00 Segments: 22 Readability: 1.00 MMM-G: 1.00
FLUX-Reason (R1) 			Entities: - Examples of Irrational Numbers: True - Examples of Rational Numbers: True - Irrational Numbers: True - Number Line: False - Rational Numbers: True - Visual Representation of Irrational Numbers: False - Visual Representation of Rational Numbers: False	Dependencies: - Contains(Number Line, Visual Representation of Irrational Numbers): False - Contains(Number Line, Visual Representation of Rational Numbers): False - Defines(Irrational Numbers, Examples of Irrational Numbers): True - Defines(Rational Numbers, Examples of Rational Numbers): True - Entails(Visual Representation of Irrational Numbers, Irrational Numbers): False - Entails(Visual Representation of Rational Numbers, Rational Numbers): False	1-GED: 0.35 Segments: 8 Readability: 1.00 MMM-G: 0.35
HiDream-11-full 			Entities: - Examples of Irrational Numbers: False - Examples of Rational Numbers: False - Irrational Numbers: False - Number Line: False - Rational Numbers: False - Visual Representation of Irrational Numbers: False - Visual Representation of Rational Numbers: False	Dependencies: - Contains(Number Line, Visual Representation of Irrational Numbers): False - Contains(Number Line, Visual Representation of Rational Numbers): False - Defines(Irrational Numbers, Examples of Irrational Numbers): False - Defines(Rational Numbers, Examples of Rational Numbers): False - Entails(Visual Representation of Irrational Numbers, Irrational Numbers): False - Entails(Visual Representation of Rational Numbers, Rational Numbers): False	1-GED: 0.00 Segments: 24 Readability: 1.00 MMM-G: 0.00
FLUX1-[pro] 			Entities: - Examples of Irrational Numbers: False - Examples of Rational Numbers: False - Irrational Numbers: False - Number Line: False - Rational Numbers: False - Visual Representation of Irrational Numbers: False - Visual Representation of Rational Numbers: False	Dependencies: - Contains(Number Line, Visual Representation of Irrational Numbers): False - Contains(Number Line, Visual Representation of Rational Numbers): False - Defines(Irrational Numbers, Examples of Irrational Numbers): False - Defines(Rational Numbers, Examples of Rational Numbers): False - Entails(Visual Representation of Irrational Numbers, Irrational Numbers): False - Entails(Visual Representation of Rational Numbers, Rational Numbers): False	1-GED: 0.00 Segments: 14 Readability: 1.00 MMM-G: 0.00
Ideogram V2 			Entities: - Examples of Irrational Numbers: False - Examples of Rational Numbers: True - Irrational Numbers: False - Number Line: False - Rational Numbers: False - Visual Representation of Irrational Numbers: False - Visual Representation of Rational Numbers: False	Dependencies: - Contains(Number Line, Visual Representation of Irrational Numbers): False - Contains(Number Line, Visual Representation of Rational Numbers): False - Defines(Irrational Numbers, Examples of Irrational Numbers): False - Defines(Rational Numbers, Examples of Rational Numbers): False - Entails(Visual Representation of Irrational Numbers, Irrational Numbers): False - Entails(Visual Representation of Rational Numbers, Rational Numbers): False	1-GED: 0.12 Segments: 53 Readability: 1.00 MMM-G: 0.12
Infinity-8B 			Entities: - Examples of Irrational Numbers: True - Examples of Rational Numbers: True - Irrational Numbers: True - Number Line: True - Rational Numbers: True - Visual Representation of Irrational Numbers: False - Visual Representation of Rational Numbers: False	Dependencies: - Contains(Number Line, Visual Representation of Irrational Numbers): False - Contains(Number Line, Visual Representation of Rational Numbers): False - Defines(Irrational Numbers, Examples of Irrational Numbers): False - Defines(Rational Numbers, Examples of Rational Numbers): False - Entails(Visual Representation of Irrational Numbers, Irrational Numbers): False - Entails(Visual Representation of Rational Numbers, Rational Numbers): False	1-GED: 0.42 Segments: 49 Readability: 1.00 MMM-G: 0.42
Seed-X 			Entities: - Examples of Irrational Numbers: False - Examples of Rational Numbers: False - Irrational Numbers: False - Number Line: False - Rational Numbers: False - Visual Representation of Irrational Numbers: False - Visual Representation of Rational Numbers: False	Dependencies: - Contains(Number Line, Visual Representation of Irrational Numbers): False - Contains(Number Line, Visual Representation of Rational Numbers): False - Defines(Irrational Numbers, Examples of Irrational Numbers): False - Defines(Rational Numbers, Examples of Rational Numbers): False - Entails(Visual Representation of Irrational Numbers, Irrational Numbers): False - Entails(Visual Representation of Rational Numbers, Rational Numbers): False	1-GED: 0.00 Segments: 59 Readability: 1.00 MMM-G: 0.00

Figure 24: MMMG Benchmark visualization for seven representative models on a Secondaryschool-Mathematics example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.3.4 Engineering

Question: Visualize an infographic illustrating how a concave lens transforms parallel light into diverging light.

GPT-4o			Entities: "Concave Lens": True "Diverging Light": True "Parallel Light": True	Dependencies: "CausesConcave Lens, Diverging Light": True "ContainsConcave Lens, Parallel Light": True	1-GED: 1.00 Segments: 14 Readability: 1.00 MMM-G: 1.00
FLUX-Reason (R1)			Entities: "Concave Lens": True "Diverging Light": True "Parallel Light": False	Dependencies: "CausesConcave Lens, Diverging Light": False "ContainsConcave Lens, Parallel Light": False	1-GED: 0.57 Segments: 25 Readability: 1.00 MMM-G: 0.57
HiDream-11-full			Entities: "Concave Lens": False "Diverging Light": True "Parallel Light": False	Dependencies: "CausesConcave Lens, Diverging Light": False "ContainsConcave Lens, Parallel Light": False	1-GED: 0.33 Segments: 29 Readability: 1.00 MMM-G: 0.33
FLUX1-[pro]			Entities: "Concave Lens": False "Diverging Light": False "Parallel Light": False	Dependencies: "CausesConcave Lens, Diverging Light": False "ContainsConcave Lens, Parallel Light": False	1-GED: 0.00 Segments: 12 Readability: 1.00 MMM-G: 0.00
Ideogram V2			Entities: "Concave Lens": False "Diverging Light": True "Parallel Light": False	Dependencies: "CausesConcave Lens, Diverging Light": False "ContainsConcave Lens, Parallel Light": False	1-GED: 0.33 Segments: 4 Readability: 1.00 MMM-G: 0.33
Infinity-8B			Entities: "Concave Lens": True "Diverging Light": True "Parallel Light": True	Dependencies: "CausesConcave Lens, Diverging Light": True "ContainsConcave Lens, Parallel Light": False	1-GED: 0.89 Segments: 60 Readability: 1.00 MMM-G: 0.89
Seed-X			Entities: "Concave Lens": True "Diverging Light": True "Parallel Light": True	Dependencies: "CausesConcave Lens, Diverging Light": True "ContainsConcave Lens, Parallel Light": True	1-GED: 1.00 Segments: 69 Readability: 1.00 MMM-G: 1.00

Figure 25: MMMG Benchmark visualization for seven representative models on a Secondaryschool-Engineering example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.3.6 Economics

Question: Visualize an infographic highlighting the characteristics and differences between a seller's market and a buyer's market in real estate.

GPT-4o				Entities: "Buyer": True "Buyer's Market": True "House": True "Seller's Market": True	Dependencies: "Contains(Buyer's Market, House)": True "Contains(Seller's Market, Buyer)": True "Contains(Seller's Market, House)": True "Requires(Buyer's Market, Buyer)": False	1-GED: 0.93 Segments: 16 Readability: 1.00 MMMG: 0.93
FLUX-Reason (R1)				Entities: "Buyer": True "Buyer's Market": True "House": True "Seller's Market": True	Dependencies: "Contains(Buyer's Market, House)": True "Contains(Seller's Market, Buyer)": True "Contains(Seller's Market, House)": True "Requires(Buyer's Market, Buyer)": False	1-GED: 0.93 Segments: 27 Readability: 1.00 MMMG: 0.93
HiDream-11-full				Entities: "Buyer": False "Buyer's Market": True "House": True "Seller's Market": True	Dependencies: "Contains(Buyer's Market, House)": True "Contains(Seller's Market, Buyer)": False "Contains(Seller's Market, House)": True "Requires(Buyer's Market, Buyer)": False	1-GED: 0.62 Segments: 92 Readability: 0.76 MMMG: 0.46
FLUX1-[pro]				Entities: "Buyer": False "Buyer's Market": True "House": True "Seller's Market": True	Dependencies: "Contains(Buyer's Market, House)": False "Contains(Seller's Market, Buyer)": False "Contains(Seller's Market, House)": False "Requires(Buyer's Market, Buyer)": False	1-GED: 0.55 Segments: 54 Readability: 1.00 MMMG: 0.55
Ideogram V2				Entities: "Buyer": False "Buyer's Market": False "House": True "Seller's Market": False	Dependencies: "Contains(Buyer's Market, House)": False "Contains(Seller's Market, Buyer)": False "Contains(Seller's Market, House)": False "Requires(Buyer's Market, Buyer)": False	1-GED: 0.22 Segments: 169 Readability: 0.00 MMMG: 0.00
Infinity-8B				Entities: "Buyer": False "Buyer's Market": True "House": True "Seller's Market": True	Dependencies: "Contains(Buyer's Market, House)": True "Contains(Seller's Market, Buyer)": False "Contains(Seller's Market, House)": True "Requires(Buyer's Market, Buyer)": False	1-GED: 0.62 Segments: 145 Readability: 0.17 MMMG: 0.10
Seed-X				Entities: "Buyer": False "Buyer's Market": False "House": True "Seller's Market": False	Dependencies: "Contains(Buyer's Market, House)": False "Contains(Seller's Market, Buyer)": False "Contains(Seller's Market, House)": False "Requires(Buyer's Market, Buyer)": False	1-GED: 0.22 Segments: 89 Readability: 0.79 MMMG: 0.18

Figure 27: MMMG Benchmark visualization for seven representative models on a Secondaryschool-Economics example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.3.7 Sociology

Question: Create an infographic comparing the concepts of cooperation and competition in social interactions.

GPT-4o    Entities: 'benefits of cooperation': True 'competition': True 'cooperation': True 'drawbacks of competition': True 'examples of competition': True 'examples of cooperation': True 'social interactions': True Dependencies: 'Contains(competition, examples of competition)': True 'Contains(cooperation, examples of cooperation)': True 'Defines(competition, social interactions)': False 'Defines(cooperation, social interactions)': False 'Entails(competition, drawbacks of competition)': True 'Entails(cooperation, benefits of cooperation)': True 'Requires(benefits of cooperation, cooperation)': False 'Requires(drawbacks of competition, competition)': False 1-GED: 0.85 Segments: 27 Readability: 1.00 MMMG: 0.85	FLUX-Reason (R1)    Entities: 'benefits of cooperation': False 'competition': True 'cooperation': True 'drawbacks of competition': False 'examples of competition': True 'examples of cooperation': True 'social interactions': True Dependencies: 'Contains(competition, examples of competition)': True 'Contains(cooperation, examples of cooperation)': True 'Defines(competition, social interactions)': False 'Defines(cooperation, social interactions)': False 'Entails(competition, drawbacks of competition)': False 'Entails(cooperation, benefits of cooperation)': False 'Requires(benefits of cooperation, cooperation)': False 'Requires(drawbacks of competition, competition)': False 1-GED: 0.55 Segments: 26 Readability: 1.00 MMMG: 0.55
HiDream-11-full    Entities: 'benefits of cooperation': False 'competition': True 'cooperation': True 'drawbacks of competition': False 'examples of competition': True 'examples of cooperation': True 'social interactions': True Dependencies: 'Contains(competition, examples of competition)': True 'Contains(cooperation, examples of cooperation)': True 'Defines(competition, social interactions)': False 'Defines(cooperation, social interactions)': False 'Entails(competition, drawbacks of competition)': False 'Entails(cooperation, benefits of cooperation)': False 'Requires(benefits of cooperation, cooperation)': False 'Requires(drawbacks of competition, competition)': False 1-GED: 0.55 Segments: 62 Readability: 1.00 MMMG: 0.55	FLUX1-[pro]    Entities: 'benefits of cooperation': False 'competition': False 'cooperation': False 'drawbacks of competition': False 'examples of competition': False 'examples of cooperation': False 'social interactions': True Dependencies: 'Contains(competition, examples of competition)': False 'Contains(cooperation, examples of cooperation)': False 'Defines(competition, social interactions)': False 'Defines(cooperation, social interactions)': False 'Entails(competition, drawbacks of competition)': False 'Entails(cooperation, benefits of cooperation)': False 'Requires(benefits of cooperation, cooperation)': False 'Requires(drawbacks of competition, competition)': False 1-GED: 0.12 Segments: 57 Readability: 1.00 MMMG: 0.12
Ideogram V2    Entities: 'benefits of cooperation': False 'competition': False 'cooperation': True 'drawbacks of competition': False 'examples of competition': False 'examples of cooperation': True 'social interactions': True Dependencies: 'Contains(competition, examples of competition)': False 'Contains(cooperation, examples of cooperation)': True 'Defines(competition, social interactions)': False 'Defines(cooperation, social interactions)': False 'Entails(competition, drawbacks of competition)': False 'Entails(cooperation, benefits of cooperation)': False 'Requires(benefits of cooperation, cooperation)': False 'Requires(drawbacks of competition, competition)': False 1-GED: 0.32 Segments: 66 Readability: 1.00 MMMG: 0.32	Infinity-8B    Entities: 'benefits of cooperation': False 'competition': True 'cooperation': True 'drawbacks of competition': False 'examples of competition': True 'examples of cooperation': True 'social interactions': True Dependencies: 'Contains(competition, examples of competition)': True 'Contains(cooperation, examples of cooperation)': True 'Defines(competition, social interactions)': False 'Defines(cooperation, social interactions)': False 'Entails(competition, drawbacks of competition)': True 'Entails(cooperation, benefits of cooperation)': True 'Requires(benefits of cooperation, cooperation)': True 'Requires(drawbacks of competition, competition)': False 1-GED: 0.58 Segments: 148 Readability: 0.13 MMMG: 0.08
Seed-X    Entities: 'benefits of cooperation': False 'competition': True 'cooperation': True 'drawbacks of competition': False 'examples of competition': False 'examples of cooperation': False 'social interactions': True Dependencies: 'Contains(competition, examples of competition)': False 'Contains(cooperation, examples of cooperation)': False 'Defines(competition, social interactions)': False 'Defines(cooperation, social interactions)': False 'Entails(competition, drawbacks of competition)': False 'Entails(cooperation, benefits of cooperation)': False 'Requires(benefits of cooperation, cooperation)': False 'Requires(drawbacks of competition, competition)': False 1-GED: 0.33 Segments: 110 Readability: 0.56 MMMG: 0.19	

Figure 28: MMMG Benchmark visualization for seven representative models on a Secondaryschool-Sociology example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.3.8 History

Question: Visualize an infographic illustrating the pathways through which immigration leads to cultural adaptation in the United States, highlighting key concepts and hidden connections.

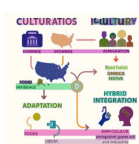
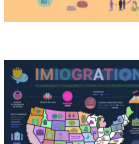
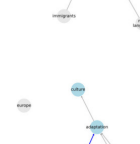
GPT-4o 			Entities: 'Adaptation': True 'Culture': True 'Customs and Traditions': False 'Europe': False 'Immigrants': True 'New Language': True 'United States': True	Dependencies: 'Causes(Immigrants, Adaptation)': True 'Contains(Adaptation, Culture)': False 'Requires(Adaptation, Customs and Traditions)': False 'Requires(Adaptation, New Language)': False	1-GED: 0.59 Segments: 32 Readability: 1.00 MMMG: 0.59
FLUX-Reason (R) 			Entities: 'Adaptation': True 'Culture': True 'Customs and Traditions': False 'Europe': False 'Immigrants': True 'New Language': False 'United States': True	Dependencies: 'Causes(Immigrants, Adaptation)': True 'Contains(Adaptation, Culture)': False 'Requires(Adaptation, Customs and Traditions)': False 'Requires(Adaptation, New Language)': False	1-GED: 0.50 Segments: 57 Readability: 1.00 MMMG: 0.50
HiDream-11-full 			Entities: 'Adaptation': False 'Culture': False 'Customs and Traditions': False 'Europe': False 'Immigrants': False 'New Language': False 'United States': True	Dependencies: 'Causes(Immigrants, Adaptation)': True 'Contains(Adaptation, Culture)': False 'Requires(Adaptation, Customs and Traditions)': False 'Requires(Adaptation, New Language)': False	1-GED: 0.17 Segments: 36 Readability: 1.00 MMMG: 0.17
FLUX-1-prol 			Entities: 'Adaptation': False 'Culture': False 'Customs and Traditions': False 'Europe': False 'Immigrants': False 'New Language': False 'United States': True	Dependencies: 'Causes(Immigrants, Adaptation)': False 'Contains(Adaptation, Culture)': False 'Requires(Adaptation, Customs and Traditions)': False 'Requires(Adaptation, New Language)': False	1-GED: 0.17 Segments: 31 Readability: 1.00 MMMG: 0.17
Ideogram V2 			Entities: 'Adaptation': False 'Culture': False 'Customs and Traditions': False 'Europe': False 'Immigrants': False 'New Language': False 'United States': True	Dependencies: 'Causes(Immigrants, Adaptation)': False 'Contains(Adaptation, Culture)': False 'Requires(Adaptation, Customs and Traditions)': False 'Requires(Adaptation, New Language)': False	1-GED: 0.17 Segments: 161 Readability: 0.00 MMMG: 0.00
Infinity-BB 			Entities: 'Adaptation': True 'Culture': True 'Customs and Traditions': False 'Europe': False 'Immigrants': True 'New Language': True 'United States': True	Dependencies: 'Causes(Immigrants, Adaptation)': True 'Contains(Adaptation, Culture)': False 'Requires(Adaptation, Customs and Traditions)': False 'Requires(Adaptation, New Language)': False	1-GED: 0.50 Segments: 149 Readability: 0.12 MMMG: 0.06
Seed-X 			Entities: 'Adaptation': False 'Culture': False 'Customs and Traditions': False 'Europe': True 'Immigrants': True 'New Language': False 'United States': True	Dependencies: 'Causes(Immigrants, Adaptation)': False 'Contains(Adaptation, Culture)': False 'Requires(Adaptation, Customs and Traditions)': False 'Requires(Adaptation, New Language)': False	1-GED: 0.43 Segments: 125 Readability: 0.39 MMMG: 0.17

Figure 29: MMMG Benchmark visualization for seven representative models on a Secondaryschool-History example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.3.9 Philosophy

Question: Visualize an infographic illustrating the cognitive model that demonstrates the relationship between situation, thought, emotion, and behavior.

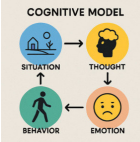
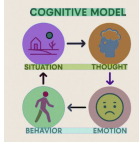
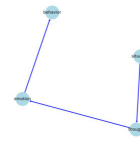
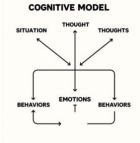
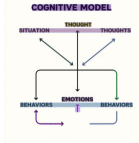
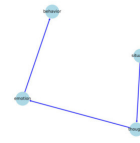
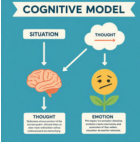
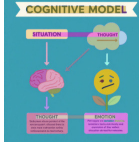
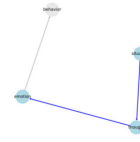
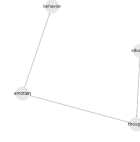
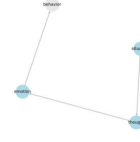
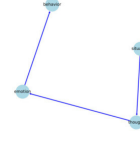
GPT-4o 			Entities: "Behavior": True "Emotion": True "Situation": True "Thought": True	Dependencies: "Causes(Emotion, Behavior)": True "Causes(Situation, Thought)": True "Causes(Thought, Emotion)": True	1-GED: 1.00 Segments: 18 Readability: 1.00 MMM: 1.00
FLUX-Reason (R) 			Entities: "Behavior": True "Emotion": True "Situation": True "Thought": True	Dependencies: "Causes(Emotion, Behavior)": True "Causes(Situation, Thought)": True "Causes(Thought, Emotion)": True	1-GED: 1.00 Segments: 12 Readability: 1.00 MMM: 1.00
HiDream-11-full 			Entities: "Behavior": False "Emotion": True "Situation": True "Thought": True	Dependencies: "Causes(Emotion, Behavior)": False "Causes(Situation, Thought)": True "Causes(Thought, Emotion)": True	1-GED: 0.67 Segments: 33 Readability: 1.00 MMM: 0.67
FLUX-1-pro 			Entities: "Behavior": False "Emotion": True "Situation": True "Thought": True	Dependencies: "Causes(Emotion, Behavior)": False "Causes(Situation, Thought)": False "Causes(Thought, Emotion)": False	1-GED: 0.60 Segments: 59 Readability: 1.00 MMM: 0.60
Ideogram V2 			Entities: "Behavior": False "Emotion": False "Situation": False "Thought": False	Dependencies: "Causes(Emotion, Behavior)": False "Causes(Situation, Thought)": False "Causes(Thought, Emotion)": False	1-GED: 0.00 Segments: 58 Readability: 1.00 MMM: 0.00
Infinity-8B 			Entities: "Behavior": False "Emotion": True "Situation": True "Thought": True	Dependencies: "Causes(Emotion, Behavior)": False "Causes(Situation, Thought)": False "Causes(Thought, Emotion)": False	1-GED: 0.60 Segments: 61 Readability: 1.00 MMM: 0.60
Seed-X 			Entities: "Behavior": True "Emotion": True "Situation": True "Thought": True	Dependencies: "Causes(Emotion, Behavior)": True "Causes(Situation, Thought)": True "Causes(Thought, Emotion)": True	1-GED: 1.00 Segments: 81 Readability: 0.88 MMM: 0.88

Figure 30: MMM Benchmark visualization for seven representative models on a Secondaryschool-Philosophy example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMM-Score along with its component sub-scores.

F.3.10 Literature

Question: Visualize a flowchart depicting the elements of a narrative arc in storytelling.

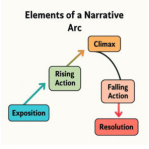
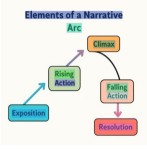
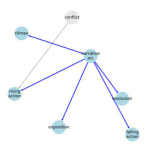
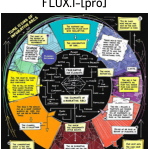
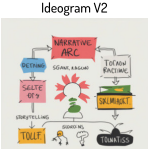
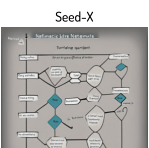
GPT-4o 			Entities: 'climax': True 'conflict': False 'exposition': True 'falling action': True 'narrative arc': True 'resolution': True 'rising action': True	Dependencies: 'Contains(narrative arc, climax)': True 'Contains(narrative arc, exposition)': True 'Contains(narrative arc, falling action)': True 'Contains(narrative arc, resolution)': True 'Contains(narrative arc, rising action)': True 'Requires(rising action, conflict)': False	1-GED: 0.58 Segments: 12 Readability: 1.00 MMMG: 0.58
FLUX-Reason (R1) 			Entities: 'climax': True 'conflict': False 'exposition': True 'falling action': True 'narrative arc': True 'resolution': True 'rising action': True	Dependencies: 'Contains(narrative arc, climax)': True 'Contains(narrative arc, exposition)': True 'Contains(narrative arc, falling action)': True 'Contains(narrative arc, resolution)': True 'Contains(narrative arc, rising action)': True 'Requires(rising action, conflict)': False	1-GED: 0.58 Segments: 17 Readability: 1.00 MMMG: 0.58
HiDream-11-full 			Entities: 'climax': False 'conflict': False 'exposition': False 'falling action': False 'narrative arc': False 'resolution': False 'rising action': False	Dependencies: 'Contains(narrative arc, climax)': False 'Contains(narrative arc, exposition)': False 'Contains(narrative arc, falling action)': False 'Contains(narrative arc, resolution)': False 'Contains(narrative arc, rising action)': False 'Requires(rising action, conflict)': False	1-GED: 0.00 Segments: 25 Readability: 1.00 MMMG: 0.00
FLUX1-[pro] 			Entities: 'climax': False 'conflict': False 'exposition': False 'falling action': False 'narrative arc': True 'resolution': False 'rising action': False	Dependencies: 'Contains(narrative arc, climax)': False 'Contains(narrative arc, exposition)': False 'Contains(narrative arc, falling action)': False 'Contains(narrative arc, resolution)': False 'Contains(narrative arc, rising action)': False 'Requires(rising action, conflict)': False	1-GED: 0.14 Segments: 30 Readability: 1.00 MMMG: 0.14
Ideogram V2 			Entities: 'climax': False 'conflict': False 'exposition': False 'falling action': False 'narrative arc': True 'resolution': False 'rising action': False	Dependencies: 'Contains(narrative arc, climax)': False 'Contains(narrative arc, exposition)': False 'Contains(narrative arc, falling action)': False 'Contains(narrative arc, resolution)': False 'Contains(narrative arc, rising action)': False 'Requires(rising action, conflict)': False	1-GED: 0.14 Segments: 54 Readability: 1.00 MMMG: 0.14
Infinity-8B 			Entities: 'climax': False 'conflict': False 'exposition': False 'falling action': False 'narrative arc': True 'resolution': False 'rising action': False	Dependencies: 'Contains(narrative arc, climax)': False 'Contains(narrative arc, exposition)': False 'Contains(narrative arc, falling action)': False 'Contains(narrative arc, resolution)': False 'Contains(narrative arc, rising action)': False 'Requires(rising action, conflict)': False	1-GED: 0.14 Segments: 57 Readability: 1.00 MMMG: 0.14
Seed-X 			Entities: 'climax': False 'conflict': False 'exposition': False 'falling action': False 'narrative arc': True 'resolution': False 'rising action': False	Dependencies: 'Contains(narrative arc, climax)': False 'Contains(narrative arc, exposition)': False 'Contains(narrative arc, falling action)': False 'Contains(narrative arc, resolution)': False 'Contains(narrative arc, rising action)': False 'Requires(rising action, conflict)': False	1-GED: 0.00 Segments: 59 Readability: 1.00 MMMG: 0.00

Figure 31: MMMG Benchmark visualization for seven representative models on a Secondaryschool-Literature example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.4 High School

F.4.1 Biology

Question: Visualize an infographic illustrating the key differences between plant and animal cells.

GPT-4o PLANT CELL VS ANIMAL CELL		Entities: "Amyoplast": False "Animal cell": True "Cell wall": True "Chloroplast": True "Cytoplasm": True "Cytoskeleton": False "Golgi apparatus": True "Lysosome": True "Mitochondrion": True "Nucleus": True ... (6 more)	Dependencies: "Contains(Animal cell, Cytoplasm)": True "Contains(Animal cell, Cytoskeleton)": False "Contains(Animal cell, Golgi apparatus)": True "Contains(Animal cell, Lysosome)": True "Contains(Animal cell, Mitochondrion)": True "Contains(Animal cell, Nucleus)": True "Contains(Animal cell, Nucleus)": True "Contains(Animal cell, Ribosomes)": False "Contains(Animal cell, Rough ER)": False "Contains(Animal cell, Smooth ER)": False ... (4 more)	1-GED: 0.64 Segments: 39 Readability: 1.00 MMMG: 0.64
FLUX-Reason (R) Plant vs Animal Cells		Entities: "Amyoplast": False "Animal cell": True "Cell wall": True "Chloroplast": True "Cytoplasm": True "Cytoskeleton": False "Golgi apparatus": False "Lysosome": False "Mitochondrion": True "Nucleus": True ... (6 more)	Dependencies: "Contains(Animal cell, Cytoplasm)": True "Contains(Animal cell, Cytoskeleton)": False "Contains(Animal cell, Golgi apparatus)": False "Contains(Animal cell, Lysosome)": False "Contains(Animal cell, Mitochondrion)": True "Contains(Animal cell, Nucleus)": True "Contains(Animal cell, Nucleus)": True "Contains(Animal cell, Ribosomes)": False "Contains(Animal cell, Rough ER)": False "Contains(Animal cell, Smooth ER)": False ... (4 more)	1-GED: 0.45 Segments: 20 Readability: 1.00 MMMG: 0.45
HiDream-11-full PLANT AND ANIMAL CELLS		Entities: "Amyoplast": False "Animal cell": False "Cell wall": False "Chloroplast": False "Cytoplasm": False "Cytoskeleton": False "Golgi apparatus": False "Lysosome": False "Mitochondrion": False "Nucleus": False ... (6 more)	Dependencies: "Contains(Animal cell, Cytoplasm)": False "Contains(Animal cell, Cytoskeleton)": False "Contains(Animal cell, Golgi apparatus)": False "Contains(Animal cell, Lysosome)": False "Contains(Animal cell, Mitochondrion)": False "Contains(Animal cell, Nucleus)": False "Contains(Animal cell, Nucleus)": False "Contains(Animal cell, Ribosomes)": False "Contains(Animal cell, Rough ER)": False "Contains(Animal cell, Smooth ER)": False ... (4 more)	1-GED: 0.00 Segments: 37 Readability: 1.00 MMMG: 0.00
FLUX1-[pro] PLANT VS ANIMAL CELLS		Entities: "Amyoplast": False "Animal cell": False "Cell wall": False "Chloroplast": False "Cytoplasm": False "Cytoskeleton": False "Golgi apparatus": False "Lysosome": False "Mitochondrion": False "Nucleus": False ... (6 more)	Dependencies: "Contains(Animal cell, Cytoplasm)": False "Contains(Animal cell, Cytoskeleton)": False "Contains(Animal cell, Golgi apparatus)": False "Contains(Animal cell, Lysosome)": False "Contains(Animal cell, Mitochondrion)": False "Contains(Animal cell, Nucleus)": False "Contains(Animal cell, Nucleus)": False "Contains(Animal cell, Ribosomes)": False "Contains(Animal cell, Rough ER)": False "Contains(Animal cell, Smooth ER)": False ... (4 more)	1-GED: 0.00 Segments: 24 Readability: 1.00 MMMG: 0.00
Ideogram V2 DIFFERENCES KEY		Entities: "Amyoplast": False "Animal cell": True "Cell wall": False "Chloroplast": False "Cytoplasm": True "Cytoskeleton": False "Golgi apparatus": False "Lysosome": False "Mitochondrion": False "Nucleus": False ... (6 more)	Dependencies: "Contains(Animal cell, Cytoplasm)": True "Contains(Animal cell, Cytoskeleton)": False "Contains(Animal cell, Golgi apparatus)": False "Contains(Animal cell, Lysosome)": False "Contains(Animal cell, Mitochondrion)": False "Contains(Animal cell, Nucleus)": False "Contains(Animal cell, Nucleus)": True "Contains(Animal cell, Ribosomes)": False "Contains(Animal cell, Rough ER)": False "Contains(Animal cell, Smooth ER)": False ... (4 more)	1-GED: 0.17 Segments: 141 Readability: 0.21 MMMG: 0.04
Infinity-8B PLANT AND ANIMAL CELLS		Entities: "Amyoplast": False "Animal cell": False "Cell wall": False "Chloroplast": False "Cytoplasm": False "Cytoskeleton": False "Golgi apparatus": False "Lysosome": False "Mitochondrion": False "Nucleus": False ... (6 more)	Dependencies: "Contains(Animal cell, Cytoplasm)": False "Contains(Animal cell, Cytoskeleton)": False "Contains(Animal cell, Golgi apparatus)": False "Contains(Animal cell, Lysosome)": False "Contains(Animal cell, Mitochondrion)": False "Contains(Animal cell, Nucleus)": False "Contains(Animal cell, Nucleus)": False "Contains(Animal cell, Ribosomes)": False "Contains(Animal cell, Rough ER)": False "Contains(Animal cell, Smooth ER)": False ... (4 more)	1-GED: 0.00 Segments: 152 Readability: 0.09 MMMG: 0.00
Seed-X PLANT AND ANIMAL CELLS		Entities: "Amyoplast": False "Animal cell": False "Cell wall": False "Chloroplast": False "Cytoplasm": False "Cytoskeleton": False "Golgi apparatus": False "Lysosome": False "Mitochondrion": False "Nucleus": False ... (6 more)	Dependencies: "Contains(Animal cell, Cytoplasm)": False "Contains(Animal cell, Cytoskeleton)": False "Contains(Animal cell, Golgi apparatus)": False "Contains(Animal cell, Lysosome)": False "Contains(Animal cell, Mitochondrion)": False "Contains(Animal cell, Nucleus)": False "Contains(Animal cell, Nucleus)": False "Contains(Animal cell, Ribosomes)": False "Contains(Animal cell, Rough ER)": False "Contains(Animal cell, Smooth ER)": False ... (4 more)	1-GED: 0.00 Segments: 80 Readability: 0.89 MMMG: 0.00

Figure 32: MMMG Benchmark visualization for seven representative models on a Highschool-Biology example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.4.2 Chemistry

Question: Produce a detailed diagram of the electrochemical cell, illustrating the components and the flow of electrons.

GPT-4o			Entities: "Anode": True "Cathode": True "Electrochemical Cell": True "Electrolyte": True "Electron Flow": True "External Circuit": True "Ionic Flow": True	Dependencies: "Causes(Electron Flow, External Circuit)": True "Contains(Electrochemical Cell, Anode)": True "Contains(Electrochemical Cell, Cathode)": True "Contains(Electrochemical Cell, Electrolyte)": True "Contains(Electrochemical Cell, External Circuit)": True "Entails(Ionic Flow, Electrolyte)": True "Requires(Electron Flow, Anode)": True "Requires(Electron Flow, Cathode)": True "TemporalOrder(Anode, Cathode)": True	I-GED: 1.00 Segments: 24 Readability: 1.00 MMMG: 1.00
FLUX-Reason (R0)			Entities: "Anode": True "Cathode": True "Electrochemical Cell": True "Electrolyte": True "Electron Flow": True "External Circuit": True "Ionic Flow": True	Dependencies: "Causes(Electron Flow, External Circuit)": False "Contains(Electrochemical Cell, Anode)": True "Contains(Electrochemical Cell, Cathode)": True "Contains(Electrochemical Cell, Electrolyte)": True "Contains(Electrochemical Cell, External Circuit)": True "Entails(Ionic Flow, Electrolyte)": False "Requires(Electron Flow, Anode)": False "Requires(Electron Flow, Cathode)": False "TemporalOrder(Anode, Cathode)": False	I-GED: 0.81 Segments: 41 Readability: 1.00 MMMG: 0.81
HiDream-11-full			Entities: "Anode": False "Cathode": False "Electrochemical Cell": True "Electrolyte": True "Electron Flow": False "External Circuit": False "Ionic Flow": False	Dependencies: "Causes(Electron Flow, External Circuit)": False "Contains(Electrochemical Cell, Anode)": False "Contains(Electrochemical Cell, Cathode)": False "Contains(Electrochemical Cell, Electrolyte)": True "Contains(Electrochemical Cell, External Circuit)": False "Entails(Ionic Flow, Electrolyte)": False "Requires(Electron Flow, Anode)": False "Requires(Electron Flow, Cathode)": False "TemporalOrder(Anode, Cathode)": False	I-GED: 0.21 Segments: 49 Readability: 1.00 MMMG: 0.21
FLUX1-[pro]			Entities: "Anode": False "Cathode": False "Electrochemical Cell": True "Electrolyte": False "Electron Flow": True "External Circuit": True "Ionic Flow": False	Dependencies: "Causes(Electron Flow, External Circuit)": False "Contains(Electrochemical Cell, Anode)": False "Contains(Electrochemical Cell, Cathode)": False "Contains(Electrochemical Cell, Electrolyte)": False "Contains(Electrochemical Cell, External Circuit)": True "Entails(Ionic Flow, Electrolyte)": False "Requires(Electron Flow, Anode)": False "Requires(Electron Flow, Cathode)": False "TemporalOrder(Anode, Cathode)": False	I-GED: 0.30 Segments: 6 Readability: 1.00 MMMG: 0.30
Ideogram V2			Entities: "Anode": False "Cathode": False "Electrochemical Cell": True "Electrolyte": True "Electron Flow": True "External Circuit": True "Ionic Flow": True	Dependencies: "Causes(Electron Flow, External Circuit)": False "Contains(Electrochemical Cell, Anode)": False "Contains(Electrochemical Cell, Cathode)": False "Contains(Electrochemical Cell, Electrolyte)": True "Contains(Electrochemical Cell, External Circuit)": False "Entails(Ionic Flow, Electrolyte)": True "Requires(Electron Flow, Anode)": False "Requires(Electron Flow, Cathode)": False "TemporalOrder(Anode, Cathode)": False	I-GED: 0.43 Segments: 86 Readability: 0.82 MMMG: 0.36
Infinity-8B			Entities: "Anode": False "Cathode": False "Electrochemical Cell": False "Electrolyte": False "Electron Flow": False "External Circuit": False "Ionic Flow": False	Dependencies: "Causes(Electron Flow, External Circuit)": False "Contains(Electrochemical Cell, Anode)": False "Contains(Electrochemical Cell, Cathode)": False "Contains(Electrochemical Cell, Electrolyte)": False "Contains(Electrochemical Cell, External Circuit)": False "Entails(Ionic Flow, Electrolyte)": False "Requires(Electron Flow, Anode)": False "Requires(Electron Flow, Cathode)": False "TemporalOrder(Anode, Cathode)": False	I-GED: 0.00 Segments: 129 Readability: 0.34 MMMG: 0.00
Seed-X			Entities: "Anode": False "Cathode": False "Electrochemical Cell": False "Electrolyte": False "Electron Flow": False "External Circuit": False "Ionic Flow": False	Dependencies: "Causes(Electron Flow, External Circuit)": False "Contains(Electrochemical Cell, Anode)": False "Contains(Electrochemical Cell, Cathode)": False "Contains(Electrochemical Cell, Electrolyte)": False "Contains(Electrochemical Cell, External Circuit)": False "Entails(Ionic Flow, Electrolyte)": False "Requires(Electron Flow, Anode)": False "Requires(Electron Flow, Cathode)": False "TemporalOrder(Anode, Cathode)": False	I-GED: 0.00 Segments: 66 Readability: 1.00 MMMG: 0.00

Figure 33: MMMG Benchmark visualization for seven representative models on a Highschool-Chemistry example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.4.3 Mathematics

Question: Visualize an infographic depicting the relationships between sets A, B, and their intersection.

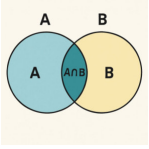
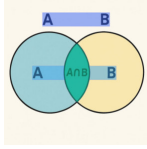
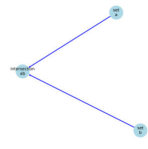
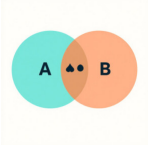
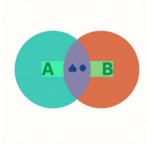
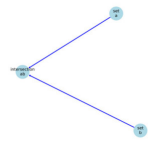
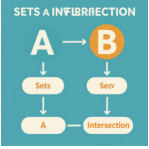
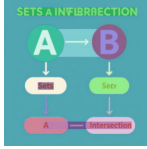
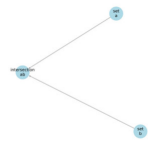
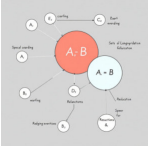
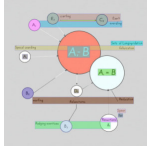
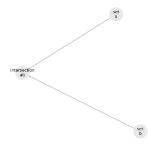
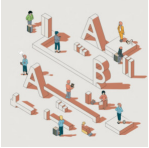
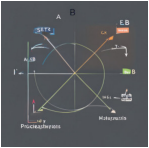
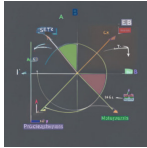
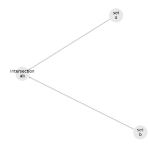
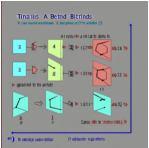
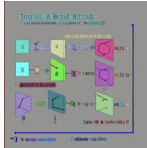
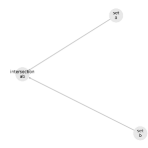
GPT-4o    Entities: "Intersection AB": True "Set A": True "Set B": True Dependencies: "Contains(Set A, Intersection AB)": True "Contains(Set B, Intersection AB)": True "RequiresIntersection AB, Set A": True "RequiresIntersection AB, Set B": True 1-GED: 1.00 Segments: 3 Readability: 1.00 MMMG: 1.00	
FLUX-Reason (R1)    Entities: "Intersection AB": True "Set A": True "Set B": True Dependencies: "Contains(Set A, Intersection AB)": True "Contains(Set B, Intersection AB)": True "RequiresIntersection AB, Set A": True "RequiresIntersection AB, Set B": True 1-GED: 1.00 Segments: 4 Readability: 1.00 MMMG: 1.00	
HiDream-11-full    Entities: "Intersection AB": True "Set A": True "Set B": True Dependencies: "Contains(Set A, Intersection AB)": False "Contains(Set B, Intersection AB)": False "RequiresIntersection AB, Set A": False "RequiresIntersection AB, Set B": False 1-GED: 0.75 Segments: 17 Readability: 1.00 MMMG: 0.75	
FLUX1-[pro]    Entities: "Intersection AB": False "Set A": False "Set B": False Dependencies: "Contains(Set A, Intersection AB)": False "Contains(Set B, Intersection AB)": False "RequiresIntersection AB, Set A": False "RequiresIntersection AB, Set B": False 1-GED: 0.00 Segments: 4 Readability: 1.00 MMMG: 0.00	
Ideogram V2    Entities: "Intersection AB": False "Set A": False "Set B": False Dependencies: "Contains(Set A, Intersection AB)": False "Contains(Set B, Intersection AB)": False "RequiresIntersection AB, Set A": False "RequiresIntersection AB, Set B": False 1-GED: 0.00 Segments: 127 Readability: 0.37 MMMG: 0.00	
Infinity-8B    Entities: "Intersection AB": False "Set A": False "Set B": False Dependencies: "Contains(Set A, Intersection AB)": False "Contains(Set B, Intersection AB)": False "RequiresIntersection AB, Set A": False "RequiresIntersection AB, Set B": False 1-GED: 0.00 Segments: 40 Readability: 1.00 MMMG: 0.00	
Seed-X    Entities: "Intersection AB": False "Set A": False "Set B": False Dependencies: "Contains(Set A, Intersection AB)": False "Contains(Set B, Intersection AB)": False "RequiresIntersection AB, Set A": False "RequiresIntersection AB, Set B": False 1-GED: 0.00 Segments: 72 Readability: 0.98 MMMG: 0.00	

Figure 34: MMMG Benchmark visualization for seven representative models on a Highschool-Mathematics example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.4.4 Engineering

Question: Visualize an infographic detailing the key components and dynamics of sound wave propagation.

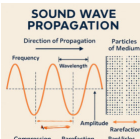
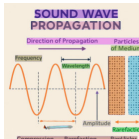
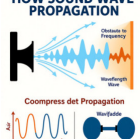
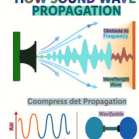
GPT-4o 			Entities: 'Amplitude': True 'Compression': True 'Crest': True 'Rarefaction': True 'Sound Waves': True 'Speaker': False 'Trough': True 'Wavelength': True	Dependencies: 'Contains(Sound Waves, Compression)': True 'Contains(Sound Waves, Rarefaction)': True 'Contains(Sound Waves, Wavelength)': True 'Contains(Wavelength, Crest)': False 'Contains(Wavelength, Trough)': True 'Requires(Sound Waves, Amplitude)': True	I-GED: 0.62 Segments: 16 Readability: 1.00 MMMG: 0.62
FLUX-Reason (R1) 			Entities: 'Amplitude': False 'Compression': False 'Crest': True 'Rarefaction': False 'Sound Waves': True 'Speaker': True 'Trough': True 'Wavelength': True	Dependencies: 'Contains(Sound Waves, Compression)': False 'Contains(Sound Waves, Rarefaction)': False 'Contains(Sound Waves, Wavelength)': True 'Contains(Wavelength, Crest)': True 'Contains(Wavelength, Trough)': True 'Requires(Sound Waves, Amplitude)': False	I-GED: 0.55 Segments: 50 Readability: 1.00 MMMG: 0.55
HiDream-11-full 			Entities: 'Amplitude': True 'Compression': False 'Crest': True 'Rarefaction': False 'Sound Waves': True 'Speaker': False 'Trough': True 'Wavelength': False	Dependencies: 'Contains(Sound Waves, Compression)': False 'Contains(Sound Waves, Rarefaction)': False 'Contains(Sound Waves, Wavelength)': False 'Contains(Wavelength, Crest)': False 'Contains(Wavelength, Trough)': False 'Requires(Sound Waves, Amplitude)': False	I-GED: 0.44 Segments: 20 Readability: 1.00 MMMG: 0.44
FLUX-1-pro 			Entities: 'Amplitude': False 'Compression': False 'Crest': True 'Rarefaction': False 'Sound Waves': True 'Speaker': True 'Trough': True 'Wavelength': False	Dependencies: 'Contains(Sound Waves, Compression)': False 'Contains(Sound Waves, Rarefaction)': False 'Contains(Sound Waves, Wavelength)': False 'Contains(Wavelength, Crest)': False 'Contains(Wavelength, Trough)': False 'Requires(Sound Waves, Amplitude)': False	I-GED: 0.44 Segments: 10 Readability: 1.00 MMMG: 0.44
Ideogram V2 			Entities: 'Amplitude': False 'Compression': False 'Crest': False 'Rarefaction': False 'Sound Waves': True 'Speaker': False 'Trough': False 'Wavelength': False	Dependencies: 'Contains(Sound Waves, Compression)': False 'Contains(Sound Waves, Rarefaction)': False 'Contains(Sound Waves, Wavelength)': False 'Contains(Wavelength, Crest)': False 'Contains(Wavelength, Trough)': False 'Requires(Sound Waves, Amplitude)': False	I-GED: 0.13 Segments: 72 Readability: 0.98 MMMG: 0.13
Infinity-8B 			Entities: 'Amplitude': True 'Compression': False 'Crest': False 'Rarefaction': False 'Sound Waves': True 'Speaker': True 'Trough': True 'Wavelength': True	Dependencies: 'Contains(Sound Waves, Compression)': False 'Contains(Sound Waves, Rarefaction)': False 'Contains(Sound Waves, Wavelength)': True 'Contains(Wavelength, Crest)': False 'Contains(Wavelength, Trough)': False 'Requires(Sound Waves, Amplitude)': False	I-GED: 0.53 Segments: 55 Readability: 1.00 MMMG: 0.53
Seed-X 			Entities: 'Amplitude': False 'Compression': False 'Crest': False 'Rarefaction': False 'Sound Waves': True 'Speaker': False 'Trough': False 'Wavelength': False	Dependencies: 'Contains(Sound Waves, Compression)': False 'Contains(Sound Waves, Rarefaction)': False 'Contains(Sound Waves, Wavelength)': False 'Contains(Wavelength, Crest)': False 'Contains(Wavelength, Trough)': False 'Requires(Sound Waves, Amplitude)': False	I-GED: 0.13 Segments: 110 Readability: 0.56 MMMG: 0.07

Figure 35: MMMG Benchmark visualization for seven representative models on a Highschool-Engineering example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.4.5 Geography

Question: Visualize an educational diagram highlighting the key zones and features of a glacier.

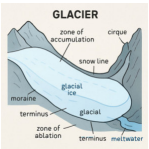
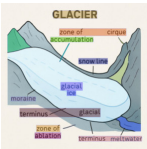
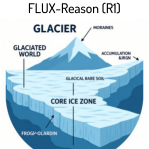
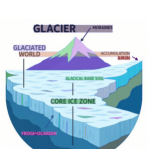
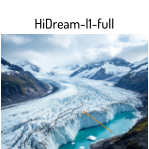
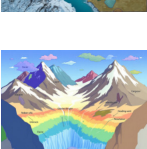
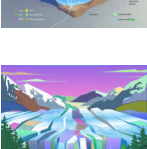
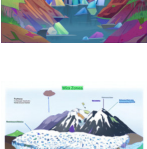
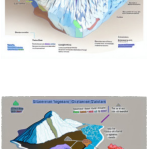
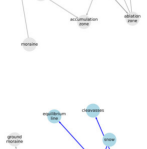
GPT-4o 			Entities: 'Ablation zone': True 'Accumulation zone': True 'Circasses': False 'Equilibrium line': False 'Frin': False 'Ground moraine': False 'Moraine': True 'Moulin': False 'Snow': True	Dependencies: 'Contains(Ablation zone, Cleavasses)': False 'Contains(Ablation zone, Moulin)': False 'Contains(Moraine, Ground moraine)': False 'Contains(Snow, Accumulation zone)': True 'Defines(Equilibrium line, Ablation zone)': False 'Requires(Accumulation zone, Frin)': False	I-GED: 0.38 Segments: 17 Readability: 1.00 MMMG: 0.38
FLUX-Reason (R0) 			Entities: 'Ablation zone': False 'Accumulation zone': True 'Cleavasses': False 'Equilibrium line': False 'Frin': False 'Ground moraine': False 'Moraine': True 'Moulin': False 'Snow': True	Dependencies: 'Contains(Ablation zone, Cleavasses)': False 'Contains(Ablation zone, Moulin)': False 'Contains(Moraine, Ground moraine)': False 'Contains(Snow, Accumulation zone)': False 'Defines(Equilibrium line, Ablation zone)': False 'Requires(Accumulation zone, Frin)': False	I-GED: 0.32 Segments: 38 Readability: 1.00 MMMG: 0.32
HiDream-11-full 			Entities: 'Ablation zone': False 'Accumulation zone': False 'Cleavasses': True 'Equilibrium line': False 'Frin': False 'Ground moraine': False 'Moraine': True 'Moulin': False 'Snow': True	Dependencies: 'Contains(Ablation zone, Cleavasses)': False 'Contains(Ablation zone, Moulin)': False 'Contains(Moraine, Ground moraine)': False 'Contains(Snow, Accumulation zone)': False 'Defines(Equilibrium line, Ablation zone)': False 'Requires(Accumulation zone, Frin)': False	I-GED: 0.32 Segments: 23 Readability: 1.00 MMMG: 0.32
FLUX1-[pro] 			Entities: 'Ablation zone': False 'Accumulation zone': False 'Cleavasses': False 'Equilibrium line': False 'Frin': False 'Ground moraine': False 'Moraine': True 'Moulin': False 'Snow': True	Dependencies: 'Contains(Ablation zone, Cleavasses)': False 'Contains(Ablation zone, Moulin)': False 'Contains(Moraine, Ground moraine)': False 'Contains(Snow, Accumulation zone)': False 'Defines(Equilibrium line, Ablation zone)': False 'Requires(Accumulation zone, Frin)': False	I-GED: 0.12 Segments: 12 Readability: 1.00 MMMG: 0.12
Ideogram V2 			Entities: 'Ablation zone': False 'Accumulation zone': False 'Cleavasses': False 'Equilibrium line': False 'Frin': False 'Ground moraine': False 'Moraine': False 'Moulin': False 'Snow': True	Dependencies: 'Contains(Ablation zone, Cleavasses)': False 'Contains(Ablation zone, Moulin)': False 'Contains(Moraine, Ground moraine)': False 'Contains(Snow, Accumulation zone)': False 'Defines(Equilibrium line, Ablation zone)': False 'Requires(Accumulation zone, Frin)': False	I-GED: 0.12 Segments: 130 Readability: 0.33 MMMG: 0.04
Infinity-8B 			Entities: 'Ablation zone': False 'Accumulation zone': False 'Cleavasses': True 'Equilibrium line': False 'Frin': False 'Ground moraine': False 'Moraine': False 'Moulin': False 'Snow': True	Dependencies: 'Contains(Ablation zone, Cleavasses)': False 'Contains(Ablation zone, Moulin)': False 'Contains(Moraine, Ground moraine)': False 'Contains(Snow, Accumulation zone)': False 'Defines(Equilibrium line, Ablation zone)': False 'Requires(Accumulation zone, Frin)': False	I-GED: 0.22 Segments: 52 Readability: 1.00 MMMG: 0.22
Seed-X 			Entities: 'Ablation zone': True 'Accumulation zone': True 'Cleavasses': True 'Equilibrium line': True 'Frin': False 'Ground moraine': False 'Moraine': True 'Moulin': False 'Snow': True	Dependencies: 'Contains(Ablation zone, Cleavasses)': True 'Contains(Ablation zone, Moulin)': False 'Contains(Moraine, Ground moraine)': False 'Contains(Snow, Accumulation zone)': True 'Defines(Equilibrium line, Ablation zone)': True 'Requires(Accumulation zone, Frin)': False	I-GED: 0.54 Segments: 55 Readability: 1.00 MMMG: 0.54

Figure 36: MMMG Benchmark visualization for seven representative models on a Highschool-Geography example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.4.6 Economics

Question: Visualize an infographic depicting the dynamics of stagflation, illustrating the relationships between GDP, unemployment, demand, and inflation during a recession.

GPT-4o			Entities: "Demand": True "GDP": True "Inflation": True "Unemployment": True	Dependencies: "Causes(Inflation, Demand)": True "Causes(Unemployment, GDP)": True "Causes(Unemployment, Inflation)": True "Requires(GDP, Demand)": False	1-GED: 0.93 Segments: 29 Readability: 1.00 MMMG: 0.93
FLUX-Reason (R)			Entities: "Demand": False "GDP": True "Inflation": True "Unemployment": False	Dependencies: "Causes(Inflation, Demand)": False "Causes(Unemployment, GDP)": False "Causes(Unemployment, Inflation)": False "Requires(GDP, Demand)": False	1-GED: 0.40 Segments: 27 Readability: 1.00 MMMG: 0.40
HiDream-11-full			Entities: "Demand": False "GDP": True "Inflation": True "Unemployment": True	Dependencies: "Causes(Inflation, Demand)": False "Causes(Unemployment, GDP)": False "Causes(Unemployment, Inflation)": False "Requires(GDP, Demand)": False	1-GED: 0.55 Segments: 15 Readability: 1.00 MMMG: 0.55
FLUX1-[pro]			Entities: "Demand": True "GDP": True "Inflation": True "Unemployment": True	Dependencies: "Causes(Inflation, Demand)": False "Causes(Unemployment, GDP)": False "Causes(Unemployment, Inflation)": False "Requires(GDP, Demand)": False	1-GED: 0.67 Segments: 3 Readability: 1.00 MMMG: 0.67
Ideogram V2			Entities: "Demand": True "GDP": True "Inflation": True "Unemployment": True	Dependencies: "Causes(Inflation, Demand)": False "Causes(Unemployment, GDP)": False "Causes(Unemployment, Inflation)": False "Requires(GDP, Demand)": False	1-GED: 0.67 Segments: 68 Readability: 1.00 MMMG: 0.67
Infinity-8B			Entities: "Demand": True "GDP": True "Inflation": True "Unemployment": True	Dependencies: "Causes(Inflation, Demand)": False "Causes(Unemployment, GDP)": False "Causes(Unemployment, Inflation)": False "Requires(GDP, Demand)": False	1-GED: 0.67 Segments: 87 Readability: 0.81 MMMG: 0.54
Seed-X			Entities: "Demand": False "GDP": False "Inflation": False "Unemployment": False	Dependencies: "Causes(Inflation, Demand)": False "Causes(Unemployment, GDP)": False "Causes(Unemployment, Inflation)": False "Requires(GDP, Demand)": False	1-GED: 0.00 Segments: 80 Readability: 0.89 MMMG: 0.00

Figure 37: MMMG Benchmark visualization for seven representative models on a Highschool-Economics example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.4.7 Sociology

Question: Visualize the interrelation of vision, mission, goals, strategies, and tactics in achieving organizational success.

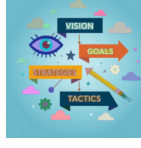
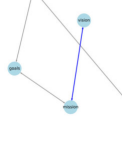
GPT-4o 			Entities: 'goals': True 'mission': True 'strategies': True 'tactics': True 'vision': True	Dependencies: 'Definesgoals, strategies': True 'Definesmission, goals': True 'Definesstrategies, tactics': True 'Definesvision, mission': True	I-GED: 1.00 Segments: 14 Readability: 1.00 MMM-G: 1.00
FLUX-Reason (R1) 			Entities: 'goals': True 'mission': False 'strategies': True 'tactics': True 'vision': True	Dependencies: 'Definesgoals, strategies': True 'Definesmission, goals': False 'Definesstrategies, tactics': True 'Definesvision, mission': False	I-GED: 0.63 Segments: 20 Readability: 1.00 MMM-G: 0.63
HiDream-11-full 			Entities: 'goals': True 'mission': False 'strategies': True 'tactics': True 'vision': True	Dependencies: 'Definesgoals, strategies': False 'Definesmission, goals': False 'Definesstrategies, tactics': True 'Definesvision, mission': False	I-GED: 0.63 Segments: 50 Readability: 1.00 MMM-G: 0.63
FLUX1-[pro] 			Entities: 'goals': True 'mission': True 'strategies': True 'tactics': False 'vision': True	Dependencies: 'Definesgoals, strategies': False 'Definesmission, goals': False 'Definesstrategies, tactics': False 'Definesvision, mission': False	I-GED: 0.47 Segments: 5 Readability: 1.00 MMM-G: 0.47
Ideogram V2 			Entities: 'goals': True 'mission': True 'strategies': True 'tactics': True 'vision': True	Dependencies: 'Definesgoals, strategies': True 'Definesmission, goals': False 'Definesstrategies, tactics': False 'Definesvision, mission': False	I-GED: 0.70 Segments: 138 Readability: 0.24 MMM-G: 0.17
Infinity-8B 			Entities: 'goals': True 'mission': True 'strategies': True 'tactics': True 'vision': True	Dependencies: 'Definesgoals, strategies': False 'Definesmission, goals': False 'Definesstrategies, tactics': False 'Definesvision, mission': True	I-GED: 0.70 Segments: 135 Readability: 0.28 MMM-G: 0.19
Seed-X 			Entities: 'goals': False 'mission': False 'strategies': False 'tactics': False 'vision': False	Dependencies: 'Definesgoals, strategies': False 'Definesmission, goals': False 'Definesstrategies, tactics': False 'Definesvision, mission': False	I-GED: 0.00 Segments: 42 Readability: 1.00 MMM-G: 0.00

Figure 38: MMMG Benchmark visualization for seven representative models on a Highschool-Sociology example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.4.8 History

Question: Visualize an infographic depicting the main components and structure of the United Nations.

			Entities: 'Economic and Social Council': False 'General Assembly': True 'International Court of Justice': True 'Secretariat': True 'Security Council': True 'Trusteeship Council': True 'United Nations': True	Dependencies: 'Contains(United Nations, Economic and Social Council)': False 'Contains(United Nations, General Assembly)': True 'Contains(United Nations, International Court of Justice)': True 'Contains(United Nations, Secretariat)': True 'Contains(United Nations, Security Council)': True 'Contains(United Nations, Trusteeship Council)': True	1-GED: 0.50 Segments: 42 Readability: 1.00 MMMG: 0.50
			Entities: 'Economic and Social Council': True 'General Assembly': True 'International Court of Justice': False 'Secretariat': False 'Security Council': False 'Trusteeship Council': False 'United Nations': True	Dependencies: 'Contains(United Nations, Economic and Social Council)': True 'Contains(United Nations, General Assembly)': True 'Contains(United Nations, International Court of Justice)': False 'Contains(United Nations, Secretariat)': False 'Contains(United Nations, Security Council)': False 'Contains(United Nations, Trusteeship Council)': False	1-GED: 0.33 Segments: 31 Readability: 1.00 MMMG: 0.33
			Entities: 'Economic and Social Council': False 'General Assembly': False 'International Court of Justice': False 'Secretariat': False 'Security Council': False 'Trusteeship Council': False 'United Nations': True	Dependencies: 'Contains(United Nations, Economic and Social Council)': False 'Contains(United Nations, General Assembly)': False 'Contains(United Nations, International Court of Justice)': False 'Contains(United Nations, Secretariat)': False 'Contains(United Nations, Security Council)': False 'Contains(United Nations, Trusteeship Council)': False	1-GED: 0.14 Segments: 83 Readability: 0.86 MMMG: 0.12
			Entities: 'Economic and Social Council': False 'General Assembly': False 'International Court of Justice': False 'Secretariat': False 'Security Council': False 'Trusteeship Council': False 'United Nations': True	Dependencies: 'Contains(United Nations, Economic and Social Council)': False 'Contains(United Nations, General Assembly)': False 'Contains(United Nations, International Court of Justice)': False 'Contains(United Nations, Secretariat)': False 'Contains(United Nations, Security Council)': False 'Contains(United Nations, Trusteeship Council)': False	1-GED: 0.14 Segments: 4 Readability: 1.00 MMMG: 0.14
			Entities: 'Economic and Social Council': False 'General Assembly': False 'International Court of Justice': True 'Secretariat': False 'Security Council': False 'Trusteeship Council': False 'United Nations': True	Dependencies: 'Contains(United Nations, Economic and Social Council)': False 'Contains(United Nations, General Assembly)': False 'Contains(United Nations, International Court of Justice)': True 'Contains(United Nations, Secretariat)': False 'Contains(United Nations, Security Council)': False 'Contains(United Nations, Trusteeship Council)': False	1-GED: 0.27 Segments: 177 Readability: 0.00 MMMG: 0.00
			Entities: 'Economic and Social Council': True 'General Assembly': True 'International Court of Justice': True 'Secretariat': True 'Security Council': True 'Trusteeship Council': True 'United Nations': True	Dependencies: 'Contains(United Nations, Economic and Social Council)': True 'Contains(United Nations, General Assembly)': True 'Contains(United Nations, International Court of Justice)': True 'Contains(United Nations, Secretariat)': True 'Contains(United Nations, Security Council)': True 'Contains(United Nations, Trusteeship Council)': True	1-GED: 1.00 Segments: 136 Readability: 0.27 MMMG: 0.27
			Entities: 'Economic and Social Council': False 'General Assembly': False 'International Court of Justice': False 'Secretariat': False 'Security Council': False 'Trusteeship Council': False 'United Nations': True	Dependencies: 'Contains(United Nations, Economic and Social Council)': False 'Contains(United Nations, General Assembly)': False 'Contains(United Nations, International Court of Justice)': False 'Contains(United Nations, Secretariat)': False 'Contains(United Nations, Security Council)': False 'Contains(United Nations, Trusteeship Council)': False	1-GED: 0.14 Segments: 83 Readability: 0.86 MMMG: 0.12

Figure 39: MMMG Benchmark visualization for seven representative models on a Highschool-History example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.4.9 Philosophy

Question: Visualize an educational poster that showcases the different types of inductive reasoning.

GPT-4o			Entities: "Analogy": True "Casual Reasoning": True "Generalization": True "Inductive Reasoning": True "Predictive Reasoning": False "Sample Reasoning": False "Statistical Reasoning": False	Dependencies: "Contains(Inductive Reasoning, Analogy)": True "Contains(Inductive Reasoning, Casual Reasoning)": True "Contains(Inductive Reasoning, Generalization)": True "Contains(Inductive Reasoning, Predictive Reasoning)": False "Contains(Inductive Reasoning, Sample Reasoning)": False "Contains(Inductive Reasoning, Statistical Reasoning)": False	I-GED: 0.40 Segments: 24 Readability: 1.00 MMMG: 0.40
FLUX-Reason (R1)			Entities: "Analogy": True "Casual Reasoning": False "Generalization": False "Inductive Reasoning": True "Predictive Reasoning": False "Sample Reasoning": False "Statistical Reasoning": True	Dependencies: "Contains(Inductive Reasoning, Analogy)": True "Contains(Inductive Reasoning, Casual Reasoning)": False "Contains(Inductive Reasoning, Generalization)": True "Contains(Inductive Reasoning, Predictive Reasoning)": False "Contains(Inductive Reasoning, Sample Reasoning)": False "Contains(Inductive Reasoning, Statistical Reasoning)": True	I-GED: 0.40 Segments: 62 Readability: 1.00 MMMG: 0.40
HiDream-11-full			Entities: "Analogy": False "Casual Reasoning": False "Generalization": False "Inductive Reasoning": True "Predictive Reasoning": False "Sample Reasoning": False "Statistical Reasoning": False	Dependencies: "Contains(Inductive Reasoning, Analogy)": False "Contains(Inductive Reasoning, Casual Reasoning)": False "Contains(Inductive Reasoning, Generalization)": False "Contains(Inductive Reasoning, Predictive Reasoning)": False "Contains(Inductive Reasoning, Sample Reasoning)": False "Contains(Inductive Reasoning, Statistical Reasoning)": False	I-GED: 0.14 Segments: 47 Readability: 1.00 MMMG: 0.14
FLUX1-[pro]			Entities: "Analogy": False "Casual Reasoning": False "Generalization": False "Inductive Reasoning": True "Predictive Reasoning": False "Sample Reasoning": False "Statistical Reasoning": False	Dependencies: "Contains(Inductive Reasoning, Analogy)": False "Contains(Inductive Reasoning, Casual Reasoning)": False "Contains(Inductive Reasoning, Generalization)": False "Contains(Inductive Reasoning, Predictive Reasoning)": False "Contains(Inductive Reasoning, Sample Reasoning)": False "Contains(Inductive Reasoning, Statistical Reasoning)": False	I-GED: 0.14 Segments: 74 Readability: 0.96 MMMG: 0.14
Ideogram V2			Entities: "Analogy": False "Casual Reasoning": False "Generalization": False "Inductive Reasoning": True "Predictive Reasoning": False "Sample Reasoning": False "Statistical Reasoning": False	Dependencies: "Contains(Inductive Reasoning, Analogy)": False "Contains(Inductive Reasoning, Casual Reasoning)": False "Contains(Inductive Reasoning, Generalization)": False "Contains(Inductive Reasoning, Predictive Reasoning)": False "Contains(Inductive Reasoning, Sample Reasoning)": False "Contains(Inductive Reasoning, Statistical Reasoning)": False	I-GED: 0.14 Segments: 90 Readability: 0.78 MMMG: 0.11
Infinity-8B			Entities: "Analogy": False "Casual Reasoning": False "Generalization": False "Inductive Reasoning": True "Predictive Reasoning": False "Sample Reasoning": False "Statistical Reasoning": False	Dependencies: "Contains(Inductive Reasoning, Analogy)": False "Contains(Inductive Reasoning, Casual Reasoning)": False "Contains(Inductive Reasoning, Generalization)": False "Contains(Inductive Reasoning, Predictive Reasoning)": False "Contains(Inductive Reasoning, Sample Reasoning)": False "Contains(Inductive Reasoning, Statistical Reasoning)": False	I-GED: 0.14 Segments: 48 Readability: 1.00 MMMG: 0.14
Seed-X			Entities: "Analogy": False "Casual Reasoning": False "Generalization": False "Inductive Reasoning": True "Predictive Reasoning": False "Sample Reasoning": False "Statistical Reasoning": False	Dependencies: "Contains(Inductive Reasoning, Analogy)": False "Contains(Inductive Reasoning, Casual Reasoning)": False "Contains(Inductive Reasoning, Generalization)": False "Contains(Inductive Reasoning, Predictive Reasoning)": False "Contains(Inductive Reasoning, Sample Reasoning)": False "Contains(Inductive Reasoning, Statistical Reasoning)": False	I-GED: 0.00 Segments: 55 Readability: 1.00 MMMG: 0.00

Figure 40: MMMG Benchmark visualization for seven representative models on a Highschool-Philosophy example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.4.10 Literature

Question: Visualize a flowchart outlining the different genres of literature and their defining features.

GPT-4o			Entities: 'defining features': True 'drama': True 'fiction': True 'flowchart': True 'genres of literature': True 'non-fiction': True 'poetry': False 'sub-genres': False	Dependencies: 'Contains(flowchart, genres of literature)': True 'Contains(genres of literature, fiction)': True 'Contains(genres of literature, non-fiction)': True 'Contains(genres of literature, poetry)': False	1-GED: 0.76 Segments: 13 Readability: 1.00 MMMG: 0.76
FLUX-Reason (R1)			Entities: 'defining features': False 'drama': False 'fiction': False 'flowchart': True 'genres of literature': True 'non-fiction': True 'poetry': True 'sub-genres': False	Dependencies: 'Contains(flowchart, genres of literature)': True 'Contains(genres of literature, fiction)': False 'Contains(genres of literature, non-fiction)': True 'Contains(genres of literature, poetry)': True	1-GED: 0.63 Segments: 10 Readability: 1.00 MMMG: 0.63
HiDream-11-full			Entities: 'defining features': True 'drama': False 'fiction': False 'flowchart': True 'genres of literature': True 'non-fiction': False 'poetry': False 'sub-genres': False	Dependencies: 'Contains(flowchart, genres of literature)': True 'Contains(genres of literature, fiction)': False 'Contains(genres of literature, non-fiction)': False 'Contains(genres of literature, poetry)': False	1-GED: 0.38 Segments: 26 Readability: 1.00 MMMG: 0.38
FLUX1-[pro]			Entities: 'defining features': False 'drama': False 'fiction': False 'flowchart': True 'genres of literature': True 'non-fiction': False 'poetry': False 'sub-genres': False	Dependencies: 'Contains(flowchart, genres of literature)': True 'Contains(genres of literature, fiction)': False 'Contains(genres of literature, non-fiction)': False 'Contains(genres of literature, poetry)': False	1-GED: 0.27 Segments: 39 Readability: 1.00 MMMG: 0.27
Ideogram V2			Entities: 'defining features': False 'drama': False 'fiction': False 'flowchart': True 'genres of literature': False 'non-fiction': False 'poetry': False 'sub-genres': False	Dependencies: 'Contains(flowchart, genres of literature)': False 'Contains(genres of literature, fiction)': False 'Contains(genres of literature, non-fiction)': False 'Contains(genres of literature, poetry)': False	1-GED: 0.15 Segments: 129 Readability: 0.34 MMMG: 0.05
Infinity-8B			Entities: 'defining features': False 'drama': False 'fiction': False 'flowchart': True 'genres of literature': False 'non-fiction': False 'poetry': False 'sub-genres': False	Dependencies: 'Contains(flowchart, genres of literature)': False 'Contains(genres of literature, fiction)': False 'Contains(genres of literature, non-fiction)': False 'Contains(genres of literature, poetry)': False	1-GED: 0.15 Segments: 105 Readability: 0.61 MMMG: 0.09
Seed-X			Entities: 'defining features': False 'drama': False 'fiction': False 'flowchart': False 'genres of literature': False 'non-fiction': False 'poetry': False 'sub-genres': False	Dependencies: 'Contains(flowchart, genres of literature)': False 'Contains(genres of literature, fiction)': False 'Contains(genres of literature, non-fiction)': False 'Contains(genres of literature, poetry)': False	1-GED: 0.00 Segments: 43 Readability: 1.00 MMMG: 0.00

Figure 41: MMMG Benchmark visualization for seven representative models on a Highschool-Literature example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.5 Undergraduate

F.5.1 Biology

Question: Visualize an infographic explaining the mechanisms of horizontal gene transfer.

GPT-4o			Entities: 'bacterial DNA': True 'conjugation': True 'donor cell': True 'foreign genetic material': True 'horizontal gene transfer': True 'plasmid': True 'recipient cell': True 'transduction': True 'transformation': True 'virus': True	Dependencies: 'Causes(transduction, bacterial DNA)': True 'Causes(transduction, virus)': False 'Causes(transformation, foreign genetic material)': True 'Contains(horizontal gene transfer, conjugation)': True 'Contains(horizontal gene transfer, transduction)': True 'Contains(horizontal gene transfer, transformation)': True 'Requires(conjugation, donor cell)': True 'Requires(conjugation, plasmid)': True 'Requires(transformation, recipient cell)': True	1-GED: 0.97 Segments: 31 Readability: 1.00 MMMG: 0.97
FLUX-Reason (R)			Entities: 'bacterial DNA': False 'conjugation': False 'donor cell': False 'foreign genetic material': False 'horizontal gene transfer': True 'plasmid': True 'recipient cell': False 'transduction': False 'transformation': True 'virus': True	Dependencies: 'Causes(transduction, bacterial DNA)': False 'Causes(transduction, virus)': False 'Causes(transformation, foreign genetic material)': True 'Contains(horizontal gene transfer, conjugation)': False 'Contains(horizontal gene transfer, transduction)': False 'Contains(horizontal gene transfer, transformation)': True 'Requires(conjugation, donor cell)': False 'Requires(conjugation, plasmid)': False 'Requires(transformation, recipient cell)': False	1-GED: 0.33 Segments: 29 Readability: 1.00 MMMG: 0.33
HiDream-11-full			Entities: 'bacterial DNA': False 'conjugation': False 'donor cell': False 'foreign genetic material': False 'horizontal gene transfer': True 'plasmid': False 'recipient cell': False 'transduction': False 'transformation': False 'virus': False	Dependencies: 'Causes(transduction, bacterial DNA)': False 'Causes(transduction, virus)': False 'Causes(transformation, foreign genetic material)': False 'Contains(horizontal gene transfer, conjugation)': False 'Contains(horizontal gene transfer, transduction)': False 'Contains(horizontal gene transfer, transformation)': False 'Requires(conjugation, donor cell)': False 'Requires(conjugation, plasmid)': False 'Requires(transformation, recipient cell)': False	1-GED: 0.10 Segments: 25 Readability: 1.00 MMMG: 0.10
FLUX1-pro			Entities: 'bacterial DNA': False 'conjugation': False 'donor cell': False 'foreign genetic material': False 'horizontal gene transfer': True 'plasmid': False 'recipient cell': False 'transduction': False 'transformation': False 'virus': True	Dependencies: 'Causes(transduction, bacterial DNA)': False 'Causes(transduction, virus)': False 'Causes(transformation, foreign genetic material)': False 'Contains(horizontal gene transfer, conjugation)': False 'Contains(horizontal gene transfer, transduction)': False 'Contains(horizontal gene transfer, transformation)': False 'Requires(conjugation, donor cell)': False 'Requires(conjugation, plasmid)': False 'Requires(transformation, recipient cell)': False	1-GED: 0.19 Segments: 66 Readability: 1.00 MMMG: 0.19
Ideogram V2			Entities: 'bacterial DNA': True 'conjugation': True 'donor cell': False 'foreign genetic material': False 'horizontal gene transfer': True 'plasmid': False 'recipient cell': False 'transduction': False 'transformation': False 'virus': True	Dependencies: 'Causes(transduction, bacterial DNA)': False 'Causes(transduction, virus)': False 'Causes(transformation, foreign genetic material)': False 'Contains(horizontal gene transfer, conjugation)': True 'Contains(horizontal gene transfer, transduction)': False 'Contains(horizontal gene transfer, transformation)': False 'Requires(conjugation, donor cell)': False 'Requires(conjugation, plasmid)': False 'Requires(transformation, recipient cell)': False	1-GED: 0.33 Segments: 147 Readability: 0.14 MMMG: 0.05
Infinity-8B			Entities: 'bacterial DNA': True 'conjugation': True 'donor cell': True 'foreign genetic material': True 'horizontal gene transfer': True 'plasmid': True 'recipient cell': True 'transduction': True 'transformation': True 'virus': True	Dependencies: 'Causes(transduction, bacterial DNA)': True 'Causes(transduction, virus)': True 'Causes(transformation, foreign genetic material)': True 'Contains(horizontal gene transfer, conjugation)': True 'Contains(horizontal gene transfer, transduction)': True 'Contains(horizontal gene transfer, transformation)': True 'Requires(conjugation, donor cell)': True 'Requires(conjugation, plasmid)': True 'Requires(transformation, recipient cell)': True	1-GED: 1.00 Segments: 123 Readability: 0.41 MMMG: 0.41
Seed-X			Entities: 'bacterial DNA': True 'conjugation': True 'donor cell': True 'foreign genetic material': True 'horizontal gene transfer': True 'plasmid': True 'recipient cell': True 'transduction': True 'transformation': True 'virus': True	Dependencies: 'Causes(transduction, bacterial DNA)': True 'Causes(transduction, virus)': False 'Causes(transformation, foreign genetic material)': True 'Contains(horizontal gene transfer, conjugation)': True 'Contains(horizontal gene transfer, transduction)': True 'Contains(horizontal gene transfer, transformation)': True 'Requires(conjugation, donor cell)': True 'Requires(conjugation, plasmid)': True 'Requires(transformation, recipient cell)': True	1-GED: 0.97 Segments: 143 Readability: 0.19 MMMG: 0.18

Figure 42: MMMG Benchmark visualization for seven representative models on a Undergraduate-Biology example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.5.2 Chemistry

Question: Design a diagram illustrating the Haber process for ammonia synthesis, highlighting reactants and conditions.

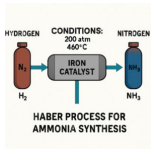
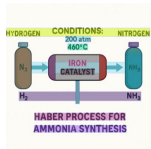
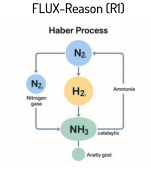
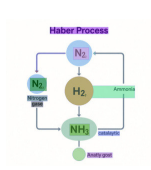
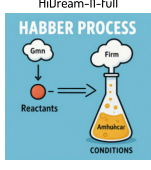
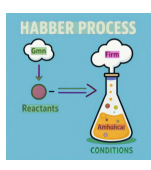
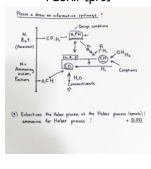
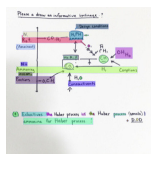
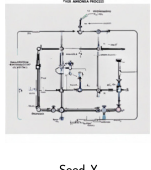
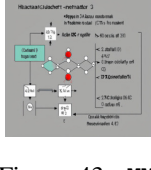
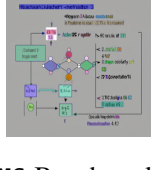
GPT-4o  HABER PROCESS FOR AMMONIA SYNTHESIS	 HABER PROCESS FOR AMMONIA SYNTHESIS		Entities: 'Haber process': True 'ammonia': True 'catalyst': True 'hydrogen': True 'nitrogen': True 'pressure': True 'reaction vessel': True 'temperature': True	Dependencies: 'Causes(Haber process, ammonia)': True 'Contains(Haber process, catalyst)': True 'Contains(Haber process, reaction vessel)': True 'Entails(hydrogen, ammonia)': True 'Entails(nitrogen, ammonia)': True 'Requires(Haber process, hydrogen)': True 'Requires(Haber process, nitrogen)': True 'Requires(Haber process, pressure)': True 'Requires(Haber process, temperature)': True	1-GED: 1.00 Segments: 17 Readability: 1.00 MMMG: 1.00
FLUX-Reason (R0)  HABER PROCESS	 HABER PROCESS		Entities: 'Haber process': True 'ammonia': True 'catalyst': True 'hydrogen': False 'nitrogen': False 'pressure': False 'reaction vessel': False 'temperature': False	Dependencies: 'Causes(Haber process, ammonia)': True 'Contains(Haber process, catalyst)': True 'Contains(Haber process, reaction vessel)': False 'Entails(hydrogen, ammonia)': False 'Entails(nitrogen, ammonia)': False 'Requires(Haber process, hydrogen)': False 'Requires(Haber process, nitrogen)': True 'Requires(Haber process, pressure)': False 'Requires(Haber process, temperature)': False	1-GED: 0.40 Segments: 15 Readability: 1.00 MMMG: 0.40
HiDream-11-full  HABER PROCESS	 HABER PROCESS		Entities: 'Haber process': True 'ammonia': False 'catalyst': False 'hydrogen': False 'nitrogen': False 'pressure': False 'reaction vessel': True 'temperature': False	Dependencies: 'Causes(Haber process, ammonia)': False 'Contains(Haber process, catalyst)': False 'Contains(Haber process, reaction vessel)': True 'Entails(hydrogen, ammonia)': False 'Entails(nitrogen, ammonia)': False 'Requires(Haber process, hydrogen)': False 'Requires(Haber process, nitrogen)': False 'Requires(Haber process, pressure)': False 'Requires(Haber process, temperature)': False	1-GED: 0.30 Segments: 22 Readability: 1.00 MMMG: 0.30
FLUX1-[pro]  HABER PROCESS	 HABER PROCESS		Entities: 'Haber process': True 'ammonia': False 'catalyst': False 'hydrogen': True 'nitrogen': False 'pressure': False 'reaction vessel': False 'temperature': False	Dependencies: 'Causes(Haber process, ammonia)': False 'Contains(Haber process, catalyst)': False 'Contains(Haber process, reaction vessel)': False 'Entails(hydrogen, ammonia)': False 'Entails(nitrogen, ammonia)': False 'Requires(Haber process, hydrogen)': False 'Requires(Haber process, nitrogen)': False 'Requires(Haber process, pressure)': False 'Requires(Haber process, temperature)': False	1-GED: 0.21 Segments: 19 Readability: 1.00 MMMG: 0.21
Ideogram V2  HABER PROCESS	 HABER PROCESS		Entities: 'Haber process': False 'ammonia': False 'catalyst': False 'hydrogen': False 'nitrogen': False 'pressure': False 'reaction vessel': True 'temperature': False	Dependencies: 'Causes(Haber process, ammonia)': False 'Contains(Haber process, catalyst)': False 'Contains(Haber process, reaction vessel)': False 'Entails(hydrogen, ammonia)': False 'Entails(nitrogen, ammonia)': False 'Requires(Haber process, hydrogen)': False 'Requires(Haber process, nitrogen)': False 'Requires(Haber process, pressure)': False 'Requires(Haber process, temperature)': False	1-GED: 0.11 Segments: 47 Readability: 1.00 MMMG: 0.11
Infinity-8B  HABER PROCESS	 HABER PROCESS		Entities: 'Haber process': True 'ammonia': True 'catalyst': False 'hydrogen': False 'nitrogen': False 'pressure': False 'reaction vessel': True 'temperature': False	Dependencies: 'Causes(Haber process, ammonia)': False 'Contains(Haber process, catalyst)': False 'Contains(Haber process, reaction vessel)': True 'Entails(hydrogen, ammonia)': False 'Entails(nitrogen, ammonia)': False 'Requires(Haber process, hydrogen)': False 'Requires(Haber process, nitrogen)': False 'Requires(Haber process, pressure)': False 'Requires(Haber process, temperature)': False	1-GED: 0.29 Segments: 84 Readability: 0.84 MMMG: 0.24
Seed-X  HABER PROCESS	 HABER PROCESS		Entities: 'Haber process': False 'ammonia': False 'catalyst': False 'hydrogen': False 'nitrogen': False 'pressure': False 'reaction vessel': False 'temperature': False	Dependencies: 'Causes(Haber process, ammonia)': False 'Contains(Haber process, catalyst)': False 'Contains(Haber process, reaction vessel)': False 'Entails(hydrogen, ammonia)': False 'Entails(nitrogen, ammonia)': False 'Requires(Haber process, hydrogen)': False 'Requires(Haber process, nitrogen)': False 'Requires(Haber process, pressure)': False 'Requires(Haber process, temperature)': False	1-GED: 0.00 Segments: 70 Readability: 1.00 MMMG: 0.00

Figure 43: MMMG Benchmark visualization for seven representative models on a Undergraduate-Chemistry example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.5.3 Mathematics

Question: Visualize a diagram showing the relationship between the areas under curves and definite integrals, accompanied by illustrative examples.

GPT-4o	Entities: 'area under curve': True 'definite integral': True 'function graph': True 'illustrative example': True 'x-axis': True 'y-axis': True	Dependencies: 'Contains(area under curve, definite integral)': False 'Contains(illustrative example, area under curve)': True 'Entails(function graph, area under curve)': True 'Requires(definite integral, function graph)': True 'Requires(definite integral, x-axis)': True 'Requires(definite integral, y-axis)': False	1-GED: 0.91 Segments: 22 Readability: 1.00 MMMG: 0.91
FLUX-Reason (R1)	Entities: 'area under curve': False 'definite integral': False 'function graph': True 'illustrative example': True 'x-axis': True 'y-axis': True	Dependencies: 'Contains(area under curve, definite integral)': False 'Contains(illustrative example, area under curve)': False 'Entails(function graph, area under curve)': False 'Requires(definite integral, function graph)': False 'Requires(definite integral, x-axis)': False 'Requires(definite integral, y-axis)': False	1-GED: 0.50 Segments: 23 Readability: 1.00 MMMG: 0.50
HiDream-11-full	Entities: 'area under curve': True 'definite integral': True 'function graph': True 'illustrative example': True 'x-axis': True 'y-axis': True	Dependencies: 'Contains(area under curve, definite integral)': False 'Contains(illustrative example, area under curve)': False 'Entails(function graph, area under curve)': False 'Requires(definite integral, function graph)': False 'Requires(definite integral, x-axis)': False 'Requires(definite integral, y-axis)': False	1-GED: 0.74 Segments: 21 Readability: 1.00 MMMG: 0.74
FLUX1-[pro]	Entities: 'area under curve': False 'definite integral': False 'function graph': True 'illustrative example': True 'x-axis': True 'y-axis': False	Dependencies: 'Contains(area under curve, definite integral)': False 'Contains(illustrative example, area under curve)': False 'Entails(function graph, area under curve)': False 'Requires(definite integral, function graph)': False 'Requires(definite integral, x-axis)': False 'Requires(definite integral, y-axis)': False	1-GED: 0.40 Segments: -5 Readability: 1.00 MMMG: 0.40
Ideogram V2	Entities: 'area under curve': False 'definite integral': False 'function graph': False 'illustrative example': False 'x-axis': False 'y-axis': False	Dependencies: 'Contains(area under curve, definite integral)': False 'Contains(illustrative example, area under curve)': False 'Entails(function graph, area under curve)': False 'Requires(definite integral, function graph)': False 'Requires(definite integral, x-axis)': False 'Requires(definite integral, y-axis)': False	1-GED: 0.00 Segments: 36 Readability: 1.00 MMMG: 0.00
Infinity-8B	Entities: 'area under curve': False 'definite integral': False 'function graph': True 'illustrative example': False 'x-axis': False 'y-axis': True	Dependencies: 'Contains(area under curve, definite integral)': False 'Contains(illustrative example, area under curve)': False 'Entails(function graph, area under curve)': False 'Requires(definite integral, function graph)': False 'Requires(definite integral, x-axis)': False 'Requires(definite integral, y-axis)': False	1-GED: 0.29 Segments: 49 Readability: 1.00 MMMG: 0.29
Seed-X	Entities: 'area under curve': False 'definite integral': False 'function graph': True 'illustrative example': True 'x-axis': True 'y-axis': True	Dependencies: 'Contains(area under curve, definite integral)': False 'Contains(illustrative example, area under curve)': False 'Entails(function graph, area under curve)': False 'Requires(definite integral, function graph)': False 'Requires(definite integral, x-axis)': False 'Requires(definite integral, y-axis)': False	1-GED: 0.50 Segments: 54 Readability: 1.00 MMMG: 0.50

Figure 44: MMMG Benchmark visualization for seven representative models on a Undergraduate-Mathematics example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.5.4 Engineering

Question: Visualize a PDF render of the stress-strain curve and its significance in material science.

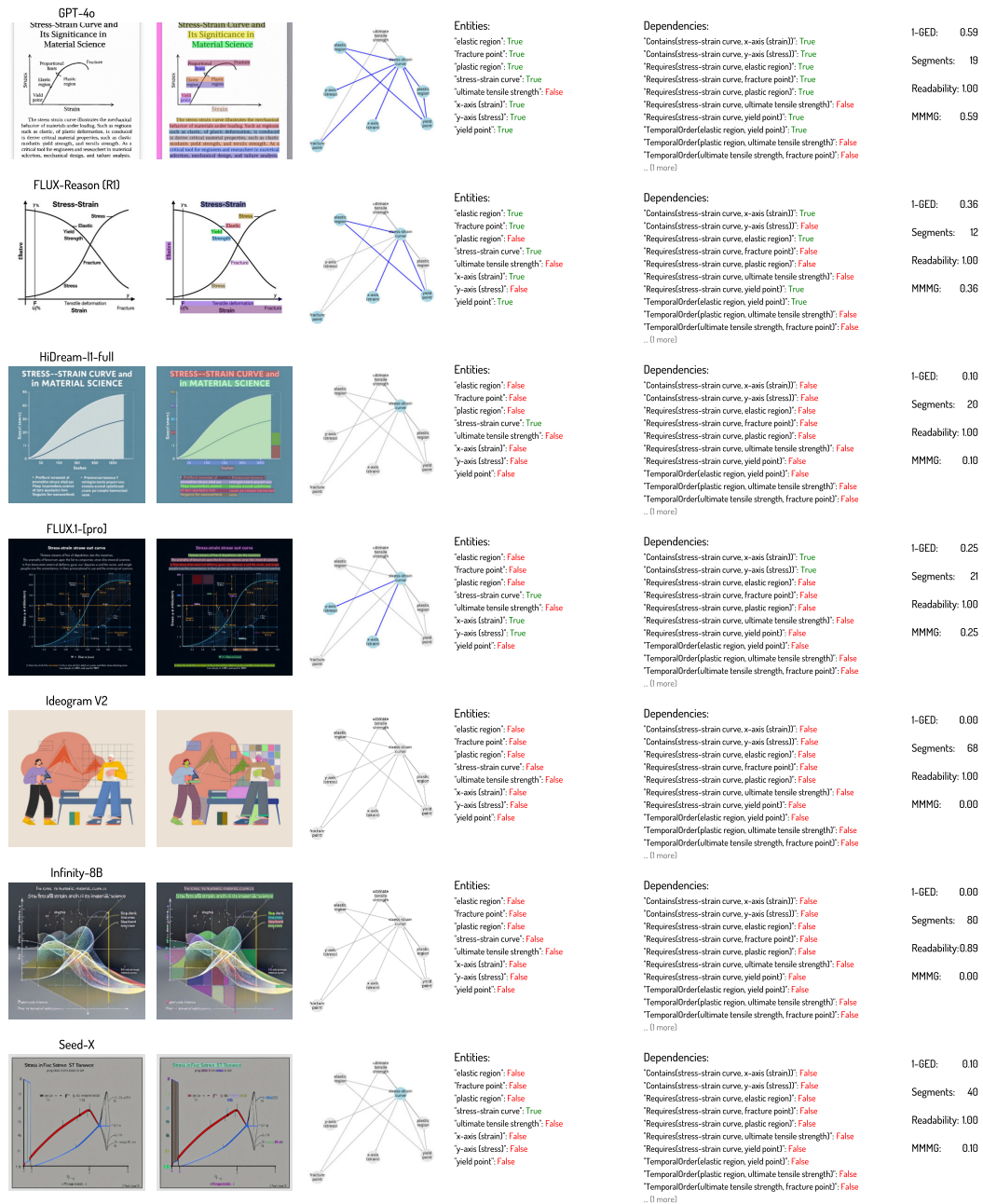


Figure 45: MMMG Benchmark visualization for seven representative models on a Undergraduate-Engineering example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.5.5 Geography

Question: Create a diagram showing the process of glacial erosion, illustrating features such as fjords and U-shaped valleys.

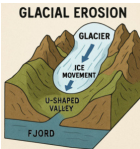
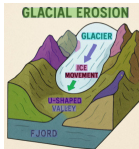
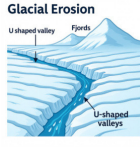
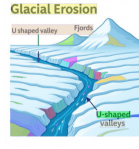
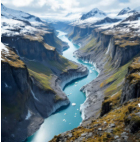
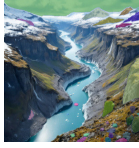
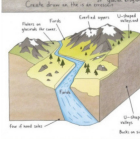
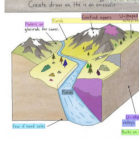
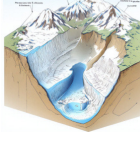
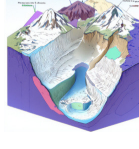
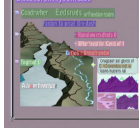
GPT-4o 			Entities: "U-shaped valley": True "fjord": True "glacial erosion": True "glacier": True "landscape": True "rock debris": False	Dependencies: "Causes(glacier, glacial erosion)": True "Contains(glacial erosion, U-shaped valley)": True "Contains(glacial erosion, fjord)": True "Contains(glacial erosion, rock debris)": False "Requires(glacial erosion, landscape)": False	I-GED: 0.84 Segments: 19 Readability: 1.00 MMMG: 0.84
FLUX-Reason (R1) 			Entities: "U-shaped valley": True "fjord": True "glacial erosion": False "glacier": True "landscape": True "rock debris": False	Dependencies: "Causes(glacier, glacial erosion)": False "Contains(glacial erosion, U-shaped valley)": False "Contains(glacial erosion, fjord)": False "Contains(glacial erosion, rock debris)": False "Requires(glacial erosion, landscape)": False	I-GED: 0.53 Segments: 38 Readability: 1.00 MMMG: 0.53
HiDream-11-full 			Entities: "U-shaped valley": True "fjord": True "glacial erosion": False "glacier": True "landscape": True "rock debris": False	Dependencies: "Causes(glacier, glacial erosion)": False "Contains(glacial erosion, U-shaped valley)": False "Contains(glacial erosion, fjord)": False "Contains(glacial erosion, rock debris)": False "Requires(glacial erosion, landscape)": False	I-GED: 0.43 Segments: 37 Readability: 1.00 MMMG: 0.43
FLUX1-[pro] 			Entities: "U-shaped valley": True "fjord": True "glacial erosion": False "glacier": True "landscape": True "rock debris": True	Dependencies: "Causes(glacier, glacial erosion)": False "Contains(glacial erosion, U-shaped valley)": False "Contains(glacial erosion, fjord)": False "Contains(glacial erosion, rock debris)": False "Requires(glacial erosion, landscape)": False	I-GED: 0.53 Segments: 6 Readability: 1.00 MMMG: 0.53
Ideogram V2 			Entities: "U-shaped valley": True "fjord": False "glacial erosion": False "glacier": True "landscape": True "rock debris": False	Dependencies: "Causes(glacier, glacial erosion)": False "Contains(glacial erosion, U-shaped valley)": False "Contains(glacial erosion, fjord)": False "Contains(glacial erosion, rock debris)": False "Requires(glacial erosion, landscape)": False	I-GED: 0.43 Segments: 86 Readability: 0.82 MMMG: 0.35
Infinity-8B 			Entities: "U-shaped valley": True "fjord": True "glacial erosion": False "glacier": True "landscape": True "rock debris": False	Dependencies: "Causes(glacier, glacial erosion)": False "Contains(glacial erosion, U-shaped valley)": False "Contains(glacial erosion, fjord)": False "Contains(glacial erosion, rock debris)": False "Requires(glacial erosion, landscape)": False	I-GED: 0.53 Segments: 33 Readability: 1.00 MMMG: 0.53
Seed-X 			Entities: "U-shaped valley": False "fjord": False "glacial erosion": False "glacier": False "landscape": True "rock debris": False	Dependencies: "Causes(glacier, glacial erosion)": False "Contains(glacial erosion, U-shaped valley)": False "Contains(glacial erosion, fjord)": False "Contains(glacial erosion, rock debris)": False "Requires(glacial erosion, landscape)": False	I-GED: 0.17 Segments: 32 Readability: 1.00 MMMG: 0.17

Figure 46: MMMG Benchmark visualization for seven representative models on a Undergraduate-Geography example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.5.6 Economics

Question: Visualize the components and implications of the PESTEL framework in an educational poster format.

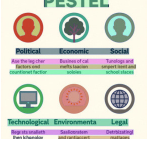
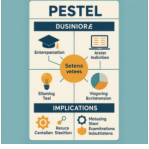
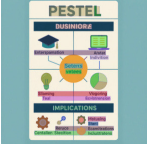
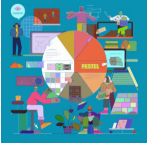
GPT-4o    Entities: - Economic: True - Environmental: True - Legal: False - PESTEL Framework: True - Political: True - Social: True - Technological: True Dependencies: - Contains(PESTEL Framework, Economic): True - Contains(PESTEL Framework, Environmental): True - Contains(PESTEL Framework, Legal): False - Contains(PESTEL Framework, Political): True - Contains(PESTEL Framework, Social): True - Contains(PESTEL Framework, Technological): True 1-GED: 0.50 Segments: 40 Readability: 1.00 MMMG: 0.50	FLUX-Reason (R1)    Entities: - Economic: True - Environmental: True - Legal: True - PESTEL Framework: True - Political: True - Social: True - Technological: True Dependencies: - Contains(PESTEL Framework, Economic): True - Contains(PESTEL Framework, Environmental): True - Contains(PESTEL Framework, Legal): True - Contains(PESTEL Framework, Political): True - Contains(PESTEL Framework, Social): True - Contains(PESTEL Framework, Technological): True 1-GED: 1.00 Segments: 24 Readability: 1.00 MMMG: 1.00
HiDream-11-full    Entities: - Economic: False - Environmental: False - Legal: False - PESTEL Framework: True - Political: False - Social: False - Technological: False Dependencies: - Contains(PESTEL Framework, Economic): False - Contains(PESTEL Framework, Environmental): False - Contains(PESTEL Framework, Legal): False - Contains(PESTEL Framework, Political): False - Contains(PESTEL Framework, Social): False - Contains(PESTEL Framework, Technological): False 1-GED: 0.14 Segments: 38 Readability: 1.00 MMMG: 0.14	FLUX1-[pro]    Entities: - Economic: False - Environmental: False - Legal: False - PESTEL Framework: True - Political: False - Social: False - Technological: False Dependencies: - Contains(PESTEL Framework, Economic): False - Contains(PESTEL Framework, Environmental): False - Contains(PESTEL Framework, Legal): False - Contains(PESTEL Framework, Political): False - Contains(PESTEL Framework, Social): False - Contains(PESTEL Framework, Technological): False 1-GED: 0.14 Segments: 13 Readability: 1.00 MMMG: 0.14
Ideogram V2    Entities: - Economic: False - Environmental: False - Legal: False - PESTEL Framework: True - Political: False - Social: False - Technological: False Dependencies: - Contains(PESTEL Framework, Economic): False - Contains(PESTEL Framework, Environmental): False - Contains(PESTEL Framework, Legal): False - Contains(PESTEL Framework, Political): False - Contains(PESTEL Framework, Social): False - Contains(PESTEL Framework, Technological): False 1-GED: 0.14 Segments: 171 Readability: 0.00 MMMG: 0.00	Infinity-8B    Entities: - Economic: False - Environmental: False - Legal: False - PESTEL Framework: True - Political: False - Social: False - Technological: False Dependencies: - Contains(PESTEL Framework, Economic): False - Contains(PESTEL Framework, Environmental): False - Contains(PESTEL Framework, Legal): False - Contains(PESTEL Framework, Political): False - Contains(PESTEL Framework, Social): False - Contains(PESTEL Framework, Technological): False 1-GED: 0.14 Segments: 74 Readability: 0.96 MMMG: 0.14
Seed-X    Entities: - Economic: False - Environmental: False - Legal: False - PESTEL Framework: True - Political: False - Social: False - Technological: False Dependencies: - Contains(PESTEL Framework, Economic): False - Contains(PESTEL Framework, Environmental): False - Contains(PESTEL Framework, Legal): False - Contains(PESTEL Framework, Political): False - Contains(PESTEL Framework, Social): False - Contains(PESTEL Framework, Technological): False 1-GED: 0.14 Segments: 68 Readability: 1.00 MMMG: 0.14	

Figure 47: MMMG Benchmark visualization for seven representative models on a Undergraduate-Economics example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.5.7 Sociology

Question: Create an infographic illustrating the stages of cognitive development and their interrelations.

GPT-4o			Entities: "Cognitive Development": True "Concrete Operational": True "Formal Operational": True "Preoperational": True "Sensory": False	Dependencies: "Contains(Cognitive Development, Concrete Operational)": True "Contains(Cognitive Development, Formal Operational)": True "Contains(Cognitive Development, Preoperational)": True "Contains(Cognitive Development, Sensory)": False "Requires(Concrete Operational, Formal Operational)": False "Requires(Preoperational, Concrete Operational)": False "Requires(Sensory, Preoperational)": False	1-GED: 0.53 Segments: 17 Readability: 1.00 MMM: 0.53
FLUX-Reason (R1)			Entities: "Cognitive Development": True "Concrete Operational": False "Formal Operational": False "Preoperational": True "Sensory": True	Dependencies: "Contains(Cognitive Development, Concrete Operational)": False "Contains(Cognitive Development, Formal Operational)": True "Contains(Cognitive Development, Preoperational)": True "Contains(Cognitive Development, Sensory)": True "Requires(Concrete Operational, Formal Operational)": False "Requires(Preoperational, Concrete Operational)": False "Requires(Sensory, Preoperational)": False	1-GED: 0.53 Segments: 57 Readability: 1.00 MMM: 0.53
HiDream-11-full			Entities: "Cognitive Development": True "Concrete Operational": False "Formal Operational": False "Preoperational": False "Sensory": False	Dependencies: "Contains(Cognitive Development, Concrete Operational)": False "Contains(Cognitive Development, Formal Operational)": False "Contains(Cognitive Development, Preoperational)": False "Contains(Cognitive Development, Sensory)": False "Requires(Concrete Operational, Formal Operational)": False "Requires(Preoperational, Concrete Operational)": False "Requires(Sensory, Preoperational)": False	1-GED: 0.15 Segments: 29 Readability: 1.00 MMM: 0.15
FLUX1-[pro]			Entities: "Cognitive Development": True "Concrete Operational": False "Formal Operational": False "Preoperational": False "Sensory": False	Dependencies: "Contains(Cognitive Development, Concrete Operational)": False "Contains(Cognitive Development, Formal Operational)": False "Contains(Cognitive Development, Preoperational)": False "Contains(Cognitive Development, Sensory)": False "Requires(Concrete Operational, Formal Operational)": False "Requires(Preoperational, Concrete Operational)": False "Requires(Sensory, Preoperational)": False	1-GED: 0.15 Segments: 19 Readability: 1.00 MMM: 0.15
Ideogram V2			Entities: "Cognitive Development": True "Concrete Operational": False "Formal Operational": False "Preoperational": False "Sensory": False	Dependencies: "Contains(Cognitive Development, Concrete Operational)": False "Contains(Cognitive Development, Formal Operational)": False "Contains(Cognitive Development, Preoperational)": False "Contains(Cognitive Development, Sensory)": False "Requires(Concrete Operational, Formal Operational)": False "Requires(Preoperational, Concrete Operational)": False "Requires(Sensory, Preoperational)": False	1-GED: 0.15 Segments: 79 Readability: 0.90 MMM: 0.14
Infinity-8B			Entities: "Cognitive Development": True "Concrete Operational": False "Formal Operational": False "Preoperational": False "Sensory": False	Dependencies: "Contains(Cognitive Development, Concrete Operational)": False "Contains(Cognitive Development, Formal Operational)": False "Contains(Cognitive Development, Preoperational)": False "Contains(Cognitive Development, Sensory)": False "Requires(Concrete Operational, Formal Operational)": False "Requires(Preoperational, Concrete Operational)": False "Requires(Sensory, Preoperational)": False	1-GED: 0.15 Segments: 121 Readability: 0.43 MMM: 0.07
Seed-X			Entities: "Cognitive Development": False "Concrete Operational": False "Formal Operational": False "Preoperational": False "Sensory": False	Dependencies: "Contains(Cognitive Development, Concrete Operational)": False "Contains(Cognitive Development, Formal Operational)": False "Contains(Cognitive Development, Preoperational)": False "Contains(Cognitive Development, Sensory)": False "Requires(Concrete Operational, Formal Operational)": False "Requires(Preoperational, Concrete Operational)": False "Requires(Sensory, Preoperational)": False	1-GED: 0.00 Segments: 92 Readability: 0.76 MMM: 0.00

Figure 48: MMMG Benchmark visualization for seven representative models on a Undergraduate-Sociology example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.5.8 History

Question: Create an educational poster on the significance of the Trail of Tears in U.S. history, emphasizing its impact on Native American communities.

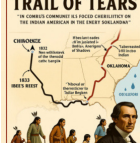
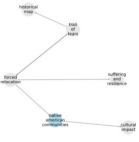
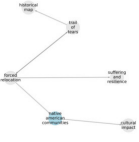
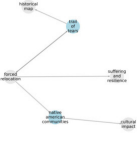
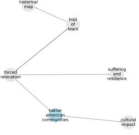
GPT-4o 		Entities: 'Cultural impact': False 'Forced relocation': True 'Historical map': False 'Native American communities': True 'Suffering and resilience': True 'Trail of Tears': True	Dependencies: 'Causes(Forced relocation, Suffering and resilience)': True 'Contains(Trail of Tears, Historical map)': False 'Defines(Trail of Tears, Forced relocation)': True 'Entails(Forced relocation, Native American communities)': True 'Requires(Cultural impact, Native American communities)': False	1-GED: 0.50 Segments: 28 Readability: 1.00 MMMG: 0.50
FLUX-Reason (R0) 		Entities: 'Cultural impact': False 'Forced relocation': True 'Historical map': True 'Native American communities': True 'Suffering and resilience': False 'Trail of Tears': True	Dependencies: 'Causes(Forced relocation, Suffering and resilience)': False 'Contains(Trail of Tears, Historical map)': True 'Defines(Trail of Tears, Forced relocation)': False 'Entails(Forced relocation, Native American communities)': False 'Requires(Cultural impact, Native American communities)': False	1-GED: 0.42 Segments: 55 Readability: 1.00 MMMG: 0.42
HiDream-11-full 		Entities: 'Cultural impact': False 'Forced relocation': False 'Historical map': False 'Native American communities': True 'Suffering and resilience': False 'Trail of Tears': False	Dependencies: 'Causes(Forced relocation, Suffering and resilience)': False 'Contains(Trail of Tears, Historical map)': False 'Defines(Trail of Tears, Forced relocation)': False 'Entails(Forced relocation, Native American communities)': False 'Requires(Cultural impact, Native American communities)': False	1-GED: 0.15 Segments: 70 Readability: 1.00 MMMG: 0.15
FLUX.1-[pro] 		Entities: 'Cultural impact': False 'Forced relocation': False 'Historical map': False 'Native American communities': True 'Suffering and resilience': False 'Trail of Tears': False	Dependencies: 'Causes(Forced relocation, Suffering and resilience)': False 'Contains(Trail of Tears, Historical map)': False 'Defines(Trail of Tears, Forced relocation)': False 'Entails(Forced relocation, Native American communities)': False 'Requires(Cultural impact, Native American communities)': False	1-GED: 0.15 Segments: 61 Readability: 1.00 MMMG: 0.15
Ideogram V2 		Entities: 'Cultural impact': False 'Forced relocation': False 'Historical map': False 'Native American communities': True 'Suffering and resilience': False 'Trail of Tears': True	Dependencies: 'Causes(Forced relocation, Suffering and resilience)': False 'Contains(Trail of Tears, Historical map)': False 'Defines(Trail of Tears, Forced relocation)': False 'Entails(Forced relocation, Native American communities)': False 'Requires(Cultural impact, Native American communities)': False	1-GED: 0.29 Segments: 149 Readability: 0.12 MMMG: 0.03
Infinity-BB 		Entities: 'Cultural impact': False 'Forced relocation': True 'Historical map': True 'Native American communities': True 'Suffering and resilience': False 'Trail of Tears': True	Dependencies: 'Causes(Forced relocation, Suffering and resilience)': False 'Contains(Trail of Tears, Historical map)': True 'Defines(Trail of Tears, Forced relocation)': False 'Entails(Forced relocation, Native American communities)': True 'Requires(Cultural impact, Native American communities)': False	1-GED: 0.56 Segments: 199 Readability: 0.00 MMMG: 0.00
Seed-X 		Entities: 'Cultural impact': False 'Forced relocation': False 'Historical map': False 'Native American communities': True 'Suffering and resilience': False 'Trail of Tears': False	Dependencies: 'Causes(Forced relocation, Suffering and resilience)': False 'Contains(Trail of Tears, Historical map)': False 'Defines(Trail of Tears, Forced relocation)': False 'Entails(Forced relocation, Native American communities)': False 'Requires(Cultural impact, Native American communities)': False	1-GED: 0.15 Segments: 33 Readability: 1.00 MMMG: 0.15

Figure 49: MMMG Benchmark visualization for seven representative models on a Undergraduate-History example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.5.9 Philosophy

Question: Visualize an infographic illustrating the levels of Maslow's Hierarchy of Needs and their interrelations.

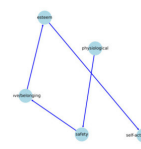
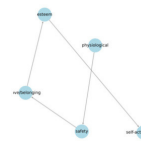
GPT-4o 			Entities: *Esteem*: True *Love/Belonging*: True *Physiological*: True *Safety*: True *Self-actualization*: True	Dependencies: *Requires(Esteem, Love/Belonging)*: True *Requires(Love/Belonging, Safety)*: True *Requires(Safety, Physiological)*: True *Requires(Self-actualization, Esteem)*: True	I-GED: 1.00 Segments: 14 Readability: 1.00 MMM: 1.00
FLUX-Reason (R) 			Entities: *Esteem*: True *Love/Belonging*: True *Physiological*: True *Safety*: True *Self-actualization*: True	Dependencies: *Requires(Esteem, Love/Belonging)*: False *Requires(Love/Belonging, Safety)*: False *Requires(Safety, Physiological)*: False *Requires(Self-actualization, Esteem)*: False	I-GED: 0.71 Segments: 26 Readability: 1.00 MMM: 0.71
HiDream-II-full 			Entities: *Esteem*: False *Love/Belonging*: False *Physiological*: False *Safety*: False *Self-actualization*: False	Dependencies: *Requires(Esteem, Love/Belonging)*: False *Requires(Love/Belonging, Safety)*: False *Requires(Safety, Physiological)*: False *Requires(Self-actualization, Esteem)*: False	I-GED: 0.00 Segments: 24 Readability: 1.00 MMM: 0.00
FLUX1-[pro] 			Entities: *Esteem*: False *Love/Belonging*: False *Physiological*: False *Safety*: False *Self-actualization*: False	Dependencies: *Requires(Esteem, Love/Belonging)*: False *Requires(Love/Belonging, Safety)*: False *Requires(Safety, Physiological)*: False *Requires(Self-actualization, Esteem)*: False	I-GED: 0.00 Segments: 54 Readability: 1.00 MMM: 0.00
Ideogram V2 			Entities: *Esteem*: False *Love/Belonging*: False *Physiological*: False *Safety*: False *Self-actualization*: False	Dependencies: *Requires(Esteem, Love/Belonging)*: False *Requires(Love/Belonging, Safety)*: False *Requires(Safety, Physiological)*: False *Requires(Self-actualization, Esteem)*: False	I-GED: 0.00 Segments: 44 Readability: 1.00 MMM: 0.00
Infinity-8B 			Entities: *Esteem*: False *Love/Belonging*: False *Physiological*: False *Safety*: False *Self-actualization*: False	Dependencies: *Requires(Esteem, Love/Belonging)*: False *Requires(Love/Belonging, Safety)*: False *Requires(Safety, Physiological)*: False *Requires(Self-actualization, Esteem)*: False	I-GED: 0.00 Segments: 63 Readability: 1.00 MMM: 0.00
Seed-X 			Entities: *Esteem*: False *Love/Belonging*: False *Physiological*: False *Safety*: False *Self-actualization*: False	Dependencies: *Requires(Esteem, Love/Belonging)*: False *Requires(Love/Belonging, Safety)*: False *Requires(Safety, Physiological)*: False *Requires(Self-actualization, Esteem)*: False	I-GED: 0.00 Segments: 75 Readability: 0.94 MMM: 0.00

Figure 50: MMM Benchmark visualization for seven representative models on a Undergraduate-Philosophy example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMM-Score along with its component sub-scores.

F.5.10 Literature

Question: Design an educational poster that illustrates the key elements of dystopian fiction using examples from literature.

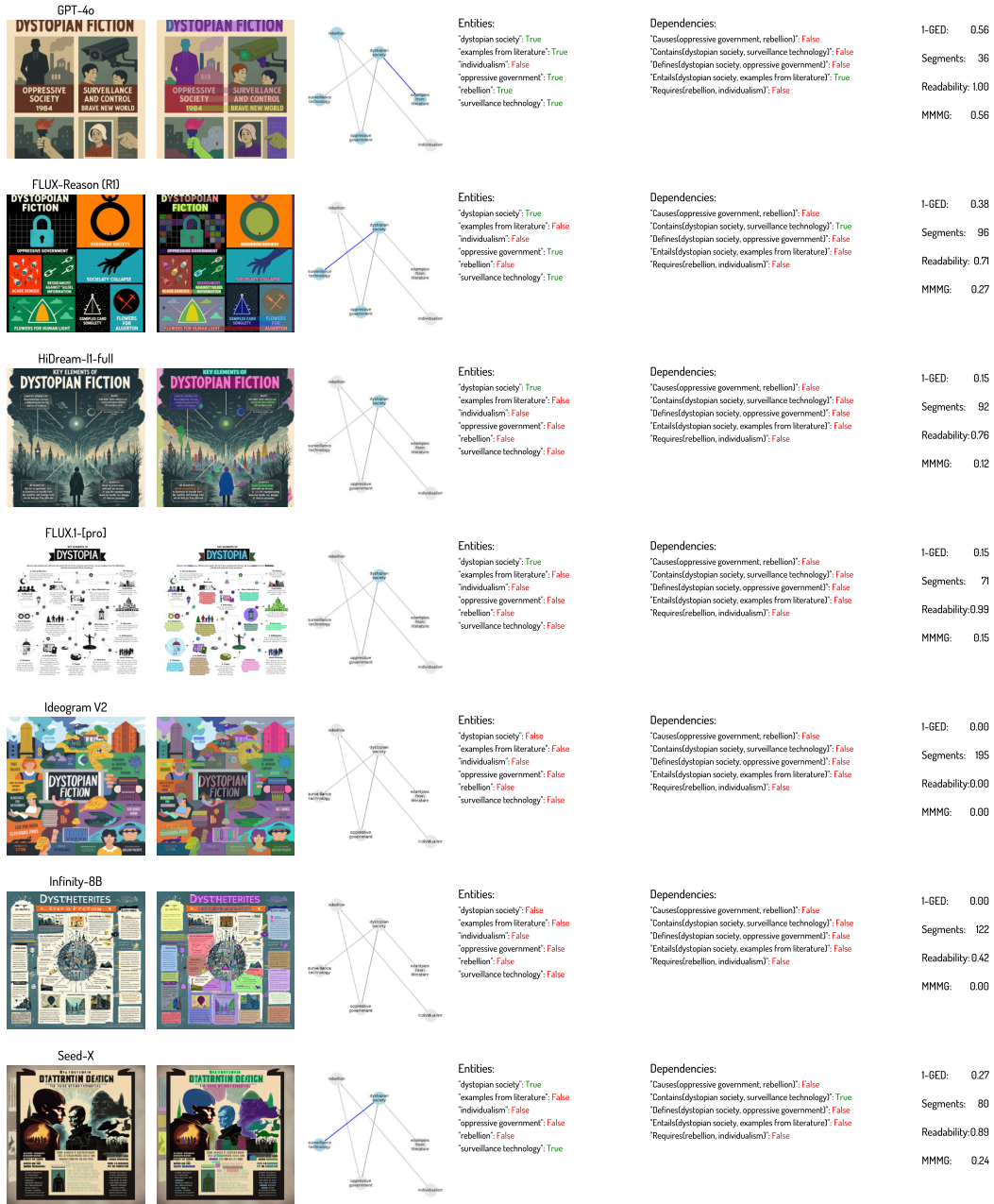


Figure 51: MMMG Benchmark visualization for seven representative models on a Undergraduate-Literature example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.6 PhD

F.6.1 Biology

Question: Visualize an infographic depicting the various methods of drug permeation enhancement through the skin.

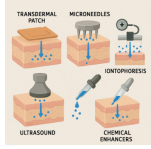
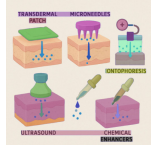
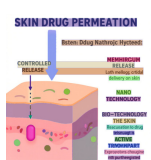
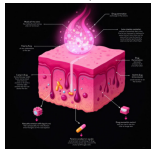
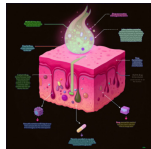
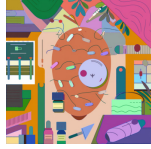
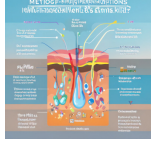
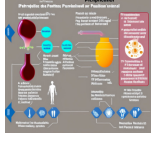
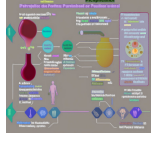
GPT-4o 			Entities: 'Adipose tissue': False 'Dendrimer': False 'Drug': True 'Electrophoresis': True 'Epidermis': True 'Liposome': False 'Microneedle': True 'Nanopip carrier': False 'Skin': True ... (3 more)	Dependencies: 'Contains(Skin, Adipose tissue)': False 'Contains(Skin, Dendrimer)': True 'Contains(Skin, Drug)': True 'Contains(Skin, Epidermis)': True 'Requires(Dendrimer, Skin)': False 'Requires(Electrophoresis, Skin)': True 'Requires(Liposome, Skin)': False 'Requires(Microneedle, Skin)': True 'Requires(Nanopip carrier, Skin)': False 'Requires(Solid Lipid Nanoparticle, Skin)': False ... (2 more)	1-GED: 0.40 Segments: 32 Readability: 1.00 MMMG: 0.40
FLUX-Reason (R) SKIN DRUG PERMEATION 			Entities: 'Adipose tissue': False 'Dendrimer': False 'Drug': True 'Electrophoresis': False 'Epidermis': True 'Liposome': False 'Microneedle': False 'Nanopip carrier': False 'Skin': True ... (3 more)	Dependencies: 'Contains(Skin, Adipose tissue)': False 'Contains(Skin, Dendrimer)': True 'Contains(Skin, Drug)': True 'Contains(Skin, Epidermis)': True 'Requires(Dendrimer, Skin)': False 'Requires(Electrophoresis, Skin)': False 'Requires(Liposome, Skin)': False 'Requires(Microneedle, Skin)': False 'Requires(Nanopip carrier, Skin)': False 'Requires(Solid Lipid Nanoparticle, Skin)': False ... (2 more)	1-GED: 0.25 Segments: 50 Readability: 1.00 MMMG: 0.25
HiDream-II-full VISUALIZE OF DRUG PERMEATION ENHANCEMENT THROUGH THE SKIN 			Entities: 'Adipose tissue': False 'Dendrimer': False 'Drug': True 'Electrophoresis': False 'Epidermis': False 'Liposome': False 'Microneedle': False 'Nanopip carrier': False 'Skin': True ... (3 more)	Dependencies: 'Contains(Skin, Adipose tissue)': False 'Contains(Skin, Dendrimer)': False 'Contains(Skin, Drug)': False 'Contains(Skin, Epidermis)': False 'Requires(Dendrimer, Skin)': False 'Requires(Electrophoresis, Skin)': False 'Requires(Liposome, Skin)': False 'Requires(Microneedle, Skin)': False 'Requires(Nanopip carrier, Skin)': False 'Requires(Solid Lipid Nanoparticle, Skin)': False ... (2 more)	1-GED: 0.15 Segments: 33 Readability: 1.00 MMMG: 0.15
FLUXI-[pro] 			Entities: 'Adipose tissue': True 'Dendrimer': False 'Drug': True 'Electrophoresis': False 'Epidermis': True 'Liposome': False 'Microneedle': True 'Nanopip carrier': False 'Skin': True ... (3 more)	Dependencies: 'Contains(Skin, Adipose tissue)': True 'Contains(Skin, Dendrimer)': True 'Contains(Skin, Drug)': True 'Contains(Skin, Epidermis)': True 'Requires(Dendrimer, Skin)': False 'Requires(Electrophoresis, Skin)': False 'Requires(Liposome, Skin)': False 'Requires(Microneedle, Skin)': True 'Requires(Nanopip carrier, Skin)': False 'Requires(Solid Lipid Nanoparticle, Skin)': False ... (2 more)	1-GED: 0.29 Segments: 31 Readability: 1.00 MMMG: 0.29
Ideogram V2 			Entities: 'Adipose tissue': False 'Dendrimer': False 'Drug': True 'Electrophoresis': False 'Epidermis': False 'Liposome': False 'Microneedle': False 'Nanopip carrier': False 'Skin': True ... (3 more)	Dependencies: 'Contains(Skin, Adipose tissue)': False 'Contains(Skin, Dendrimer)': False 'Contains(Skin, Drug)': True 'Contains(Skin, Epidermis)': False 'Requires(Dendrimer, Skin)': False 'Requires(Electrophoresis, Skin)': False 'Requires(Liposome, Skin)': False 'Requires(Microneedle, Skin)': False 'Requires(Nanopip carrier, Skin)': False 'Requires(Solid Lipid Nanoparticle, Skin)': False ... (2 more)	1-GED: 0.20 Segments: 136 Readability: 0.27 MMMG: 0.05
Infinity-8B 			Entities: 'Adipose tissue': True 'Dendrimer': False 'Drug': True 'Electrophoresis': False 'Epidermis': True 'Liposome': False 'Microneedle': True 'Nanopip carrier': False 'Skin': True ... (3 more)	Dependencies: 'Contains(Skin, Adipose tissue)': True 'Contains(Skin, Dendrimer)': True 'Contains(Skin, Drug)': True 'Contains(Skin, Epidermis)': True 'Requires(Dendrimer, Skin)': False 'Requires(Electrophoresis, Skin)': False 'Requires(Liposome, Skin)': False 'Requires(Microneedle, Skin)': True 'Requires(Nanopip carrier, Skin)': False 'Requires(Solid Lipid Nanoparticle, Skin)': False ... (2 more)	1-GED: 0.37 Segments: 125 Readability: 0.39 MMMG: 0.14
Seed-X 			Entities: 'Adipose tissue': False 'Dendrimer': False 'Drug': False 'Electrophoresis': False 'Epidermis': False 'Liposome': False 'Microneedle': False 'Nanopip carrier': False 'Skin': False ... (3 more)	Dependencies: 'Contains(Skin, Adipose tissue)': False 'Contains(Skin, Dendrimer)': False 'Contains(Skin, Drug)': False 'Contains(Skin, Epidermis)': False 'Requires(Dendrimer, Skin)': False 'Requires(Electrophoresis, Skin)': False 'Requires(Liposome, Skin)': False 'Requires(Microneedle, Skin)': False 'Requires(Nanopip carrier, Skin)': False 'Requires(Solid Lipid Nanoparticle, Skin)': False ... (2 more)	1-GED: 0.00 Segments: 101 Readability: 0.66 MMMG: 0.00

Figure 52: MMMG Benchmark visualization for seven representative models on a PhD-Biology example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.6.2 Chemistry

Question: Visualize the process of synthesizing mesoporous silica nanoparticles (MSNs) through surfactant self-assembly and co-assembly with silica precursors in an educational poster format.

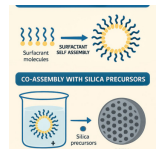
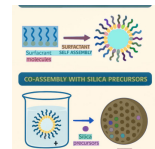
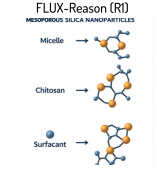
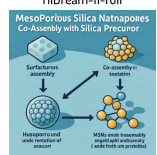
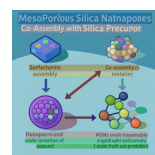
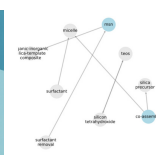
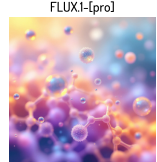
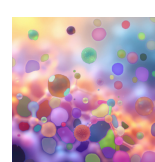
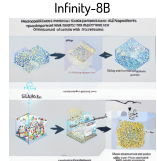
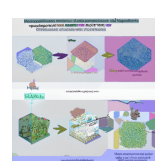
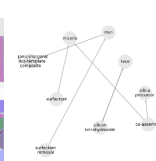
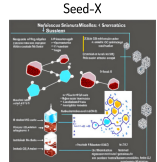
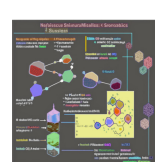
GPT-4o 			Entities: 'Co-assembly': True 'MSN': True 'Micelle': True 'Organic-inorganic silica-template composite': False 'Silica precursor': True 'Silicon tetrahydroxide': False 'Surfactant': True 'Surfactant removal': False 'TEOS': False	Dependencies: 'Causes(Surfactant removal, MSN)': False 'Causes(Surfactant, Micelle)': True 'Contains(Co-assembly, Silica precursor)': True 'Defines(TEOS, Silicon tetrahydroxide)': False 'Entails(MSN, Organic-inorganic silica-template composite)': False 'Requires(Micelle, Co-assembly)': True	1-GED: 0.50 Segments: 50 Readability: 1.00 MMM: 0.50
FLUX-Reason (R0) 			Entities: 'Co-assembly': False 'MSN': True 'Micelle': True 'Organic-inorganic silica-template composite': False 'Silica precursor': False 'Silicon tetrahydroxide': False 'Surfactant': True 'Surfactant removal': False 'TEOS': False	Dependencies: 'Causes(Surfactant removal, MSN)': False 'Causes(Surfactant, Micelle)': False 'Contains(Co-assembly, Silica precursor)': False 'Defines(TEOS, Silicon tetrahydroxide)': False 'Entails(MSN, Organic-inorganic silica-template composite)': False 'Requires(Micelle, Co-assembly)': False	1-GED: 0.32 Segments: 54 Readability: 1.00 MMM: 0.32
HiDream-11-full 			Entities: 'Co-assembly': True 'MSN': True 'Micelle': False 'Organic-inorganic silica-template composite': False 'Silica precursor': False 'Silicon tetrahydroxide': False 'Surfactant': False 'Surfactant removal': False 'TEOS': False	Dependencies: 'Causes(Surfactant removal, MSN)': False 'Causes(Surfactant, Micelle)': False 'Contains(Co-assembly, Silica precursor)': False 'Defines(TEOS, Silicon tetrahydroxide)': False 'Entails(MSN, Organic-inorganic silica-template composite)': False 'Requires(Micelle, Co-assembly)': False	1-GED: 0.22 Segments: 66 Readability: 1.00 MMM: 0.22
FLUX1-[pro] 			Entities: 'Co-assembly': False 'MSN': False 'Micelle': False 'Organic-inorganic silica-template composite': False 'Silica precursor': False 'Silicon tetrahydroxide': False 'Surfactant': False 'Surfactant removal': False 'TEOS': False	Dependencies: 'Causes(Surfactant removal, MSN)': False 'Causes(Surfactant, Micelle)': False 'Contains(Co-assembly, Silica precursor)': False 'Defines(TEOS, Silicon tetrahydroxide)': False 'Entails(MSN, Organic-inorganic silica-template composite)': False 'Requires(Micelle, Co-assembly)': False	1-GED: 0.00 Segments: 71 Readability: 0.99 MMM: 0.00
Ideogram V2 			Entities: 'Co-assembly': False 'MSN': False 'Micelle': False 'Organic-inorganic silica-template composite': False 'Silica precursor': False 'Silicon tetrahydroxide': False 'Surfactant': False 'Surfactant removal': False 'TEOS': False	Dependencies: 'Causes(Surfactant removal, MSN)': False 'Causes(Surfactant, Micelle)': False 'Contains(Co-assembly, Silica precursor)': False 'Defines(TEOS, Silicon tetrahydroxide)': False 'Entails(MSN, Organic-inorganic silica-template composite)': False 'Requires(Micelle, Co-assembly)': False	1-GED: 0.00 Segments: 176 Readability: 0.00 MMM: 0.00
Infinity-BB 			Entities: 'Co-assembly': False 'MSN': False 'Micelle': False 'Organic-inorganic silica-template composite': False 'Silica precursor': False 'Silicon tetrahydroxide': False 'Surfactant': False 'Surfactant removal': False 'TEOS': False	Dependencies: 'Causes(Surfactant removal, MSN)': False 'Causes(Surfactant, Micelle)': False 'Contains(Co-assembly, Silica precursor)': False 'Defines(TEOS, Silicon tetrahydroxide)': False 'Entails(MSN, Organic-inorganic silica-template composite)': False 'Requires(Micelle, Co-assembly)': False	1-GED: 0.00 Segments: 68 Readability: 1.00 MMM: 0.00
Seed-X 			Entities: 'Co-assembly': False 'MSN': False 'Micelle': False 'Organic-inorganic silica-template composite': False 'Silica precursor': False 'Silicon tetrahydroxide': False 'Surfactant': False 'Surfactant removal': False 'TEOS': False	Dependencies: 'Causes(Surfactant removal, MSN)': False 'Causes(Surfactant, Micelle)': False 'Contains(Co-assembly, Silica precursor)': False 'Defines(TEOS, Silicon tetrahydroxide)': False 'Entails(MSN, Organic-inorganic silica-template composite)': False 'Requires(Micelle, Co-assembly)': False	1-GED: 0.00 Segments: 97 Readability: 0.70 MMM: 0.00

Figure 53: MMMG Benchmark visualization for seven representative models on a PhD-Chemistry example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.6.3 Mathematics

Question: Visualize an infographic illustrating the different types of regression and their relationships.

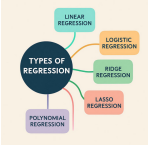
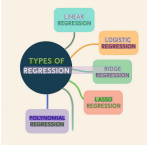
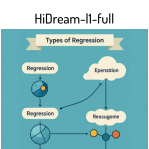
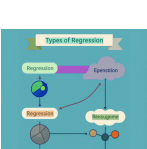
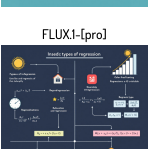
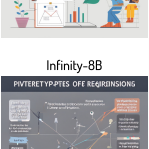
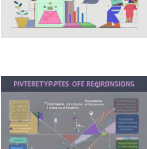
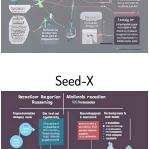
GPT-4o 			Entities: 'ElasticNet Regression': False 'Lasso Regression': True 'Linear Regression': True 'Logistic Regression': True 'Polynomial Regression': True 'Regression Types': True 'Ridge Regression': True 'Stepwise Linear Regression': False	Dependencies: 'Contains(Regression Types, ElasticNet Regression)': False 'Contains(Regression Types, Lasso Regression)': True 'Contains(Regression Types, Linear Regression)': True 'Contains(Regression Types, Logistic Regression)': True 'Contains(Regression Types, Polynomial Regression)': True 'Contains(Regression Types, Ridge Regression)': True 'Contains(Regression Types, Stepwise Linear Regression)': False	1-GED: 0.46 Segments: 15 Readability: 1.00 MMMG: 0.46
FLUX-Reason (R1) 			Entities: 'ElasticNet Regression': False 'Lasso Regression': False 'Linear Regression': False 'Logistic Regression': False 'Polynomial Regression': True 'Regression Types': True 'Ridge Regression': True 'Stepwise Linear Regression': False	Dependencies: 'Contains(Regression Types, ElasticNet Regression)': False 'Contains(Regression Types, Lasso Regression)': False 'Contains(Regression Types, Linear Regression)': False 'Contains(Regression Types, Logistic Regression)': False 'Contains(Regression Types, Polynomial Regression)': True 'Contains(Regression Types, Ridge Regression)': True 'Contains(Regression Types, Stepwise Linear Regression)': False	1-GED: 0.36 Segments: 6 Readability: 1.00 MMMG: 0.36
HiDream-11-full 			Entities: 'ElasticNet Regression': False 'Lasso Regression': False 'Linear Regression': False 'Logistic Regression': False 'Polynomial Regression': False 'Regression Types': True 'Ridge Regression': True 'Stepwise Linear Regression': False	Dependencies: 'Contains(Regression Types, ElasticNet Regression)': False 'Contains(Regression Types, Lasso Regression)': False 'Contains(Regression Types, Linear Regression)': False 'Contains(Regression Types, Logistic Regression)': False 'Contains(Regression Types, Polynomial Regression)': False 'Contains(Regression Types, Ridge Regression)': True 'Contains(Regression Types, Stepwise Linear Regression)': False	1-GED: 0.12 Segments: 28 Readability: 1.00 MMMG: 0.12
FLUX1-[pro] 			Entities: 'ElasticNet Regression': False 'Lasso Regression': False 'Linear Regression': False 'Logistic Regression': False 'Polynomial Regression': False 'Regression Types': True 'Ridge Regression': False 'Stepwise Linear Regression': False	Dependencies: 'Contains(Regression Types, ElasticNet Regression)': False 'Contains(Regression Types, Lasso Regression)': False 'Contains(Regression Types, Linear Regression)': False 'Contains(Regression Types, Logistic Regression)': False 'Contains(Regression Types, Polynomial Regression)': False 'Contains(Regression Types, Ridge Regression)': False 'Contains(Regression Types, Stepwise Linear Regression)': False	1-GED: 0.12 Segments: 33 Readability: 1.00 MMMG: 0.12
Ideogram V2 			Entities: 'ElasticNet Regression': False 'Lasso Regression': False 'Linear Regression': False 'Logistic Regression': False 'Polynomial Regression': False 'Regression Types': False 'Ridge Regression': False 'Stepwise Linear Regression': False	Dependencies: 'Contains(Regression Types, ElasticNet Regression)': False 'Contains(Regression Types, Lasso Regression)': False 'Contains(Regression Types, Linear Regression)': False 'Contains(Regression Types, Logistic Regression)': False 'Contains(Regression Types, Polynomial Regression)': False 'Contains(Regression Types, Ridge Regression)': False 'Contains(Regression Types, Stepwise Linear Regression)': False	1-GED: 0.00 Segments: 112 Readability: 0.53 MMMG: 0.00
Infinity-8B 			Entities: 'ElasticNet Regression': False 'Lasso Regression': False 'Linear Regression': False 'Logistic Regression': False 'Polynomial Regression': False 'Regression Types': False 'Ridge Regression': False 'Stepwise Linear Regression': False	Dependencies: 'Contains(Regression Types, ElasticNet Regression)': False 'Contains(Regression Types, Lasso Regression)': False 'Contains(Regression Types, Linear Regression)': False 'Contains(Regression Types, Logistic Regression)': False 'Contains(Regression Types, Polynomial Regression)': False 'Contains(Regression Types, Ridge Regression)': False 'Contains(Regression Types, Stepwise Linear Regression)': False	1-GED: 0.00 Segments: 96 Readability: 0.71 MMMG: 0.00
Seed-X 			Entities: 'ElasticNet Regression': False 'Lasso Regression': False 'Linear Regression': False 'Logistic Regression': False 'Polynomial Regression': False 'Regression Types': False 'Ridge Regression': False 'Stepwise Linear Regression': False	Dependencies: 'Contains(Regression Types, ElasticNet Regression)': False 'Contains(Regression Types, Lasso Regression)': False 'Contains(Regression Types, Linear Regression)': False 'Contains(Regression Types, Logistic Regression)': False 'Contains(Regression Types, Polynomial Regression)': False 'Contains(Regression Types, Ridge Regression)': False 'Contains(Regression Types, Stepwise Linear Regression)': False	1-GED: 0.00 Segments: 87 Readability: 0.81 MMMG: 0.00

Figure 54: MMMG Benchmark visualization for seven representative models on a PhD-Mathematics example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.6.4 Engineering

Question: Visualize an infographic depicting the key theories in soil mechanics and their interrelations.

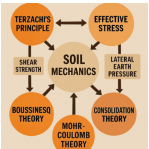
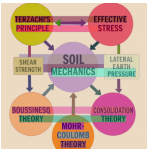
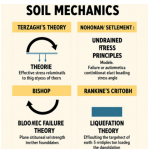
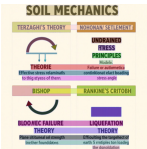
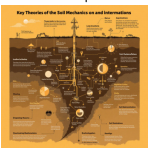
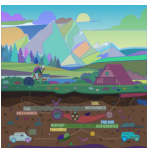
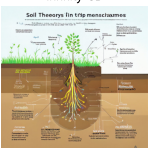
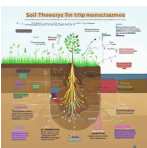
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FLUX-Reason (R1) 			Entities: 'Boussinesq's Theory': False 'Consolidation Theory': False 'Coulomb's Law': False 'Hazen's Law': False 'Mohr-Coulomb': False 'Poisuille's Law': False 'Rankine's Theory': True 'Soil Mechanics Theories': True 'Stoke's Law': False 'Terzaghi's Principle': True	Dependencies: 'Contains(Soil Mechanics Theories, Boussinesq's Theory)': False 'Contains(Soil Mechanics Theories, Consolidation Theory)': False 'Contains(Soil Mechanics Theories, Coulomb's Law)': False 'Contains(Soil Mechanics Theories, Hazen's Law)': False 'Contains(Soil Mechanics Theories, Mohr-Coulomb)': False 'Contains(Soil Mechanics Theories, Poissuille's Law)': False 'Contains(Soil Mechanics Theories, Rankine's Theory)': True 'Contains(Soil Mechanics Theories, Stoke's Law)': False 'Contains(Soil Mechanics Theories, Terzaghi's Principle)': True	1-GED: 0.25 Segments: 28 Readability: 1.00 MMMG: 0.25
HiDream-11-full 			Entities: 'Boussinesq's Theory': False 'Consolidation Theory': False 'Coulomb's Law': False 'Hazen's Law': False 'Mohr-Coulomb': False 'Poisuille's Law': False 'Rankine's Theory': False 'Soil Mechanics Theories': False 'Stoke's Law': False 'Terzaghi's Principle': False	Dependencies: 'Contains(Soil Mechanics Theories, Boussinesq's Theory)': False 'Contains(Soil Mechanics Theories, Consolidation Theory)': False 'Contains(Soil Mechanics Theories, Coulomb's Law)': False 'Contains(Soil Mechanics Theories, Hazen's Law)': False 'Contains(Soil Mechanics Theories, Mohr-Coulomb)': False 'Contains(Soil Mechanics Theories, Poissuille's Law)': False 'Contains(Soil Mechanics Theories, Rankine's Theory)': False 'Contains(Soil Mechanics Theories, Stoke's Law)': False 'Contains(Soil Mechanics Theories, Terzaghi's Principle)': False	1-GED: 0.00 Segments: 41 Readability: 1.00 MMMG: 0.00
FLUX1-[pro] 			Entities: 'Boussinesq's Theory': False 'Consolidation Theory': False 'Coulomb's Law': False 'Hazen's Law': False 'Mohr-Coulomb': False 'Poisuille's Law': False 'Rankine's Theory': False 'Soil Mechanics Theories': True 'Stoke's Law': False 'Terzaghi's Principle': False	Dependencies: 'Contains(Soil Mechanics Theories, Boussinesq's Theory)': False 'Contains(Soil Mechanics Theories, Consolidation Theory)': False 'Contains(Soil Mechanics Theories, Coulomb's Law)': False 'Contains(Soil Mechanics Theories, Hazen's Law)': False 'Contains(Soil Mechanics Theories, Mohr-Coulomb)': False 'Contains(Soil Mechanics Theories, Poissuille's Law)': False 'Contains(Soil Mechanics Theories, Rankine's Theory)': False 'Contains(Soil Mechanics Theories, Stoke's Law)': False 'Contains(Soil Mechanics Theories, Terzaghi's Principle)': False	1-GED: 0.10 Segments: 55 Readability: 1.00 MMMG: 0.10
Ideogram V2 			Entities: 'Boussinesq's Theory': False 'Consolidation Theory': False 'Coulomb's Law': False 'Hazen's Law': False 'Mohr-Coulomb': False 'Poisuille's Law': False 'Rankine's Theory': False 'Soil Mechanics Theories': False 'Stoke's Law': False 'Terzaghi's Principle': False	Dependencies: 'Contains(Soil Mechanics Theories, Boussinesq's Theory)': False 'Contains(Soil Mechanics Theories, Consolidation Theory)': False 'Contains(Soil Mechanics Theories, Coulomb's Law)': False 'Contains(Soil Mechanics Theories, Hazen's Law)': False 'Contains(Soil Mechanics Theories, Mohr-Coulomb)': False 'Contains(Soil Mechanics Theories, Poissuille's Law)': False 'Contains(Soil Mechanics Theories, Rankine's Theory)': False 'Contains(Soil Mechanics Theories, Stoke's Law)': False 'Contains(Soil Mechanics Theories, Terzaghi's Principle)': False	1-GED: 0.00 Segments: 161 Readability: 0.00 MMMG: 0.00
Infinity-8B 			Entities: 'Boussinesq's Theory': False 'Consolidation Theory': False 'Coulomb's Law': False 'Hazen's Law': False 'Mohr-Coulomb': False 'Poisuille's Law': False 'Rankine's Theory': False 'Soil Mechanics Theories': False 'Stoke's Law': False 'Terzaghi's Principle': False	Dependencies: 'Contains(Soil Mechanics Theories, Boussinesq's Theory)': False 'Contains(Soil Mechanics Theories, Consolidation Theory)': False 'Contains(Soil Mechanics Theories, Coulomb's Law)': False 'Contains(Soil Mechanics Theories, Hazen's Law)': False 'Contains(Soil Mechanics Theories, Mohr-Coulomb)': False 'Contains(Soil Mechanics Theories, Poissuille's Law)': False 'Contains(Soil Mechanics Theories, Rankine's Theory)': False 'Contains(Soil Mechanics Theories, Stoke's Law)': False 'Contains(Soil Mechanics Theories, Terzaghi's Principle)': False	1-GED: 0.00 Segments: 78 Readability: 0.91 MMMG: 0.00
Seed-X 			Entities: 'Boussinesq's Theory': False 'Consolidation Theory': False 'Coulomb's Law': False 'Hazen's Law': False 'Mohr-Coulomb': False 'Poisuille's Law': False 'Rankine's Theory': False 'Soil Mechanics Theories': False 'Stoke's Law': False 'Terzaghi's Principle': False	Dependencies: 'Contains(Soil Mechanics Theories, Boussinesq's Theory)': False 'Contains(Soil Mechanics Theories, Consolidation Theory)': False 'Contains(Soil Mechanics Theories, Coulomb's Law)': False 'Contains(Soil Mechanics Theories, Hazen's Law)': False 'Contains(Soil Mechanics Theories, Mohr-Coulomb)': False 'Contains(Soil Mechanics Theories, Poissuille's Law)': False 'Contains(Soil Mechanics Theories, Rankine's Theory)': False 'Contains(Soil Mechanics Theories, Stoke's Law)': False 'Contains(Soil Mechanics Theories, Terzaghi's Principle)': False	1-GED: 0.00 Segments: 65 Readability: 1.00 MMMG: 0.00

Figure 55: MMMG Benchmark visualization for seven representative models on a PhD-Engineering example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.6.5 Geography

Question: Visualize an infographic illustrating the various methods of detecting exoplanets and their comparisons.

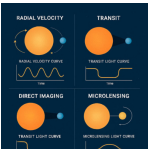
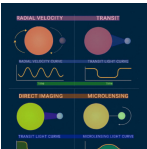
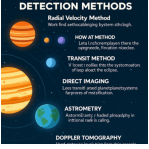
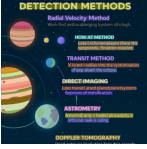
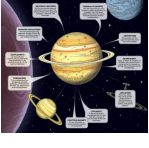
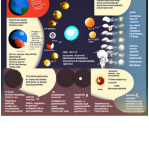
GPT-4o    Entities: 'Brightness': False 'Direct Imaging': True 'Earth': False 'Exoplanet': False 'Host Star': True 'Microlensing': True 'Planet': True 'Planet b': False 'Planet c': False 'Planet d': False ... (4 more) Dependencies: 'Contains(Direct Imaging, Planet b)': False 'Contains(Direct Imaging, Planet c)': False 'Contains(Direct Imaging, Planet d)': False 'Contains(Microlensing, Earth)': False 'Contains(Microlensing, Host Star)': True 'Entails(Transit Photometry, Planet)': True 'Entails(Transit Photometry, Star)': True 'Requires(Radial Velocity, Exoplanet)': True 'Requires(Radial Velocity, Host Star)': True 1-GED: 0.46 Segments: 18 Readability: 1.00 MMMG: 0.46	
FLUX-Reason (R1)    Entities: 'Brightness': False 'Direct Imaging': True 'Earth': True 'Exoplanet': True 'Host Star': False 'Microlensing': False 'Planet': True 'Planet b': False 'Planet c': False 'Planet d': False ... (4 more) Dependencies: 'Contains(Direct Imaging, Planet b)': False 'Contains(Direct Imaging, Planet c)': False 'Contains(Direct Imaging, Planet d)': False 'Contains(Microlensing, Earth)': False 'Contains(Microlensing, Host Star)': False 'Entails(Transit Photometry, Planet)': False 'Entails(Transit Photometry, Star)': False 'Requires(Radial Velocity, Exoplanet)': False 'Requires(Radial Velocity, Host Star)': False 1-GED: 0.47 Segments: 53 Readability: 1.00 MMMG: 0.47	
HiDream-11-full    Entities: 'Brightness': False 'Direct Imaging': False 'Earth': False 'Exoplanet': True 'Host Star': False 'Microlensing': False 'Planet': True 'Planet b': False 'Planet c': False 'Planet d': False ... (4 more) Dependencies: 'Contains(Direct Imaging, Planet b)': False 'Contains(Direct Imaging, Planet c)': False 'Contains(Direct Imaging, Planet d)': False 'Contains(Microlensing, Earth)': False 'Contains(Microlensing, Host Star)': False 'Entails(Transit Photometry, Planet)': False 'Entails(Transit Photometry, Star)': False 'Requires(Radial Velocity, Exoplanet)': False 'Requires(Radial Velocity, Host Star)': False 1-GED: 0.23 Segments: 26 Readability: 1.00 MMMG: 0.23	
FLUX1-[pro]    Entities: 'Brightness': False 'Direct Imaging': False 'Earth': False 'Exoplanet': True 'Host Star': False 'Microlensing': False 'Planet': True 'Planet b': False 'Planet c': False 'Planet d': False ... (4 more) Dependencies: 'Contains(Direct Imaging, Planet b)': False 'Contains(Direct Imaging, Planet c)': False 'Contains(Direct Imaging, Planet d)': False 'Contains(Microlensing, Earth)': False 'Contains(Microlensing, Host Star)': False 'Entails(Transit Photometry, Planet)': False 'Entails(Transit Photometry, Star)': False 'Requires(Radial Velocity, Exoplanet)': False 'Requires(Radial Velocity, Host Star)': False 1-GED: 0.23 Segments: 10 Readability: 1.00 MMMG: 0.23	
Ideogram V2    Entities: 'Brightness': False 'Direct Imaging': False 'Earth': True 'Exoplanet': False 'Host Star': False 'Microlensing': False 'Planet': True 'Planet b': False 'Planet c': False 'Planet d': False ... (4 more) Dependencies: 'Contains(Direct Imaging, Planet b)': False 'Contains(Direct Imaging, Planet c)': False 'Contains(Direct Imaging, Planet d)': False 'Contains(Microlensing, Earth)': False 'Contains(Microlensing, Host Star)': False 'Entails(Transit Photometry, Planet)': False 'Entails(Transit Photometry, Star)': False 'Requires(Radial Velocity, Exoplanet)': False 'Requires(Radial Velocity, Host Star)': False 1-GED: 0.23 Segments: 52 Readability: 1.00 MMMG: 0.23	
Infinity-BB    Entities: 'Brightness': False 'Direct Imaging': False 'Earth': True 'Exoplanet': False 'Host Star': True 'Microlensing': False 'Planet': True 'Planet b': False 'Planet c': False 'Planet d': False ... (4 more) Dependencies: 'Contains(Direct Imaging, Planet b)': False 'Contains(Direct Imaging, Planet c)': False 'Contains(Direct Imaging, Planet d)': False 'Contains(Microlensing, Earth)': False 'Contains(Microlensing, Host Star)': False 'Entails(Transit Photometry, Planet)': False 'Entails(Transit Photometry, Star)': False 'Requires(Radial Velocity, Exoplanet)': False 'Requires(Radial Velocity, Host Star)': False 1-GED: 0.30 Segments: 55 Readability: 1.00 MMMG: 0.30	
Seed-X    Entities: 'Brightness': False 'Direct Imaging': False 'Earth': True 'Exoplanet': False 'Host Star': True 'Microlensing': False 'Planet': True 'Planet b': False 'Planet c': False 'Planet d': False ... (4 more) Dependencies: 'Contains(Direct Imaging, Planet b)': False 'Contains(Direct Imaging, Planet c)': False 'Contains(Direct Imaging, Planet d)': False 'Contains(Microlensing, Earth)': False 'Contains(Microlensing, Host Star)': False 'Entails(Transit Photometry, Planet)': False 'Entails(Transit Photometry, Star)': False 'Requires(Radial Velocity, Exoplanet)': False 'Requires(Radial Velocity, Host Star)': False 1-GED: 0.30 Segments: 92 Readability: 0.76 MMMG: 0.22	

Figure 56: MMMG Benchmark visualization for seven representative models on a PhD-Geography example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.6.6 Economics

Question: Visualize an infographic analyzing the effects of a price ceiling on market equilibrium and surpluses.

GPT-4o		Entities: 'Consumer surplus': True 'Deadweight loss': True 'Demand curve': True 'Equilibrium quantity': True 'Free market equilibrium': True 'Market price at equilibrium': True 'Price ceiling': True 'Producer surplus': True 'Supply curve': True	Dependencies: 'Causes'Price ceiling, Deadweight loss': False 'Contains'Demand curve, Consumer surplus': False 'Contains'Supply curve, Producer surplus': False 'Defines'Free market equilibrium, Market price at equilibrium': True 'Entails'Free market equilibrium, Equilibrium quantity': True 'Requires'Price ceiling, Free market equilibrium': False	1-GED: 0.86 Segments: 19 Readability: 1.00 MMMG: 0.86
FLUX-Reason (R1)		Entities: 'Consumer surplus': False 'Deadweight loss': False 'Demand curve': True 'Equilibrium quantity': False 'Free market equilibrium': False 'Market price at equilibrium': False 'Price ceiling': True 'Producer surplus': False 'Supply curve': True	Dependencies: 'Causes'Price ceiling, Deadweight loss': False 'Contains'Demand curve, Consumer surplus': False 'Contains'Supply curve, Producer surplus': False 'Defines'Free market equilibrium, Market price at equilibrium': False 'Entails'Free market equilibrium, Equilibrium quantity': False 'Requires'Price ceiling, Free market equilibrium': False	1-GED: 0.32 Segments: 39 Readability: 1.00 MMMG: 0.32
HiDream-11-full		Entities: 'Consumer surplus': False 'Deadweight loss': False 'Demand curve': True 'Equilibrium quantity': True 'Free market equilibrium': True 'Market price at equilibrium': True 'Price ceiling': True 'Producer surplus': False 'Supply curve': True	Dependencies: 'Causes'Price ceiling, Deadweight loss': False 'Contains'Demand curve, Consumer surplus': False 'Contains'Supply curve, Producer surplus': False 'Defines'Free market equilibrium, Market price at equilibrium': True 'Entails'Free market equilibrium, Equilibrium quantity': True 'Requires'Price ceiling, Free market equilibrium': False	1-GED: 0.48 Segments: 29 Readability: 1.00 MMMG: 0.48
FLUX1-[pro]		Entities: 'Consumer surplus': False 'Deadweight loss': False 'Demand curve': False 'Equilibrium quantity': False 'Free market equilibrium': False 'Market price at equilibrium': False 'Price ceiling': False 'Producer surplus': False 'Supply curve': False	Dependencies: 'Causes'Price ceiling, Deadweight loss': False 'Contains'Demand curve, Consumer surplus': False 'Contains'Supply curve, Producer surplus': False 'Defines'Free market equilibrium, Market price at equilibrium': False 'Entails'Free market equilibrium, Equilibrium quantity': False 'Requires'Price ceiling, Free market equilibrium': False	1-GED: 0.00 Segments: 56 Readability: 1.00 MMMG: 0.00
Ideogram V2		Entities: 'Consumer surplus': False 'Deadweight loss': False 'Demand curve': False 'Equilibrium quantity': False 'Free market equilibrium': False 'Market price at equilibrium': False 'Price ceiling': False 'Producer surplus': False 'Supply curve': False	Dependencies: 'Causes'Price ceiling, Deadweight loss': False 'Contains'Demand curve, Consumer surplus': False 'Contains'Supply curve, Producer surplus': False 'Defines'Free market equilibrium, Market price at equilibrium': False 'Entails'Free market equilibrium, Equilibrium quantity': False 'Requires'Price ceiling, Free market equilibrium': False	1-GED: 0.00 Segments: 165 Readability: 0.00 MMMG: 0.00
Infinity-8B		Entities: 'Consumer surplus': False 'Deadweight loss': False 'Demand curve': True 'Equilibrium quantity': False 'Free market equilibrium': False 'Market price at equilibrium': False 'Price ceiling': True 'Producer surplus': False 'Supply curve': True	Dependencies: 'Causes'Price ceiling, Deadweight loss': False 'Contains'Demand curve, Consumer surplus': False 'Contains'Supply curve, Producer surplus': False 'Defines'Free market equilibrium, Market price at equilibrium': False 'Entails'Free market equilibrium, Equilibrium quantity': False 'Requires'Price ceiling, Free market equilibrium': False	1-GED: 0.32 Segments: 145 Readability: 0.17 MMMG: 0.05
Seed-X		Entities: 'Consumer surplus': False 'Deadweight loss': False 'Demand curve': False 'Equilibrium quantity': False 'Free market equilibrium': False 'Market price at equilibrium': False 'Price ceiling': False 'Producer surplus': False 'Supply curve': False	Dependencies: 'Causes'Price ceiling, Deadweight loss': False 'Contains'Demand curve, Consumer surplus': False 'Contains'Supply curve, Producer surplus': False 'Defines'Free market equilibrium, Market price at equilibrium': False 'Entails'Free market equilibrium, Equilibrium quantity': False 'Requires'Price ceiling, Free market equilibrium': False	1-GED: 0.00 Segments: 81 Readability: 0.88 MMMG: 0.00

Figure 57: MMMG Benchmark visualization for seven representative models on a PhD-Economics example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.6.7 Sociology

Question: Visualize the key components and relationships that define an Age Friendly City in an infographic format.

GPT-4o			Entities: 'Age Friendly City': True 'Civic Participation and Employment': False 'Co-Production': False 'Communication and Information': True 'Community support and health services': True 'Diversity': False 'Equity': False 'Housing': True 'Outdoor Spaces and Buildings': True 'Respect and Social Inclusion': True ... (2 more)	Dependencies: 'Contains(Age Friendly City, Civic Participation and Employment)': False 'Contains(Age Friendly City, Communication and Information)': True 'Contains(Age Friendly City, Community support and health services)': True 'Contains(Age Friendly City, Housing)': True 'Contains(Age Friendly City, Outdoor Spaces and Buildings)': True 'Contains(Age Friendly City, Respect and Social Inclusion)': True 'Contains(Age Friendly City, Social Participation)': True 'Contains(Age Friendly City, Transport)': True 'Requires(Co-Production, Age Friendly City)': False 'Requires(Diversity, Age Friendly City)': False ... (2 more)	1-GED: 0.41 Segments: 30 Readability: 1.00 MMMG: 0.41
FLUX-Reason (R0)			Entities: 'Age Friendly City': True 'Civic Participation and Employment': False 'Co-Production': False 'Communication and Information': False 'Community support and health services': False 'Diversity': False 'Equity': False 'Housing': True 'Outdoor Spaces and Buildings': False 'Respect and Social Inclusion': False ... (2 more)	Dependencies: 'Contains(Age Friendly City, Civic Participation and Employment)': False 'Contains(Age Friendly City, Communication and Information)': False 'Contains(Age Friendly City, Community support and health services)': False 'Contains(Age Friendly City, Housing)': True 'Contains(Age Friendly City, Outdoor Spaces and Buildings)': False 'Contains(Age Friendly City, Respect and Social Inclusion)': False 'Contains(Age Friendly City, Social Participation)': False 'Contains(Age Friendly City, Transport)': True 'Requires(Co-Production, Age Friendly City)': False 'Requires(Diversity, Age Friendly City)': False ... (2 more)	1-GED: 0.28 Segments: 36 Readability: 1.00 MMMG: 0.28
HiDream-11-full			Entities: 'Age Friendly City': True 'Civic Participation and Employment': True 'Co-Production': False 'Communication and Information': False 'Community support and health services': False 'Diversity': False 'Equity': False 'Housing': True 'Outdoor Spaces and Buildings': True 'Respect and Social Inclusion': False ... (2 more)	Dependencies: 'Contains(Age Friendly City, Civic Participation and Employment)': True 'Contains(Age Friendly City, Communication and Information)': False 'Contains(Age Friendly City, Community support and health services)': False 'Contains(Age Friendly City, Housing)': True 'Contains(Age Friendly City, Outdoor Spaces and Buildings)': True 'Contains(Age Friendly City, Respect and Social Inclusion)': False 'Contains(Age Friendly City, Social Participation)': True 'Contains(Age Friendly City, Transport)': False 'Requires(Co-Production, Age Friendly City)': False 'Requires(Diversity, Age Friendly City)': False ... (2 more)	1-GED: 0.30 Segments: 78 Readability: 0.91 MMMG: 0.28
FLUX1-[pro]			Entities: 'Age Friendly City': True 'Civic Participation and Employment': False 'Co-Production': False 'Communication and Information': False 'Community support and health services': False 'Diversity': False 'Equity': False 'Housing': True 'Outdoor Spaces and Buildings': True 'Respect and Social Inclusion': False ... (2 more)	Dependencies: 'Contains(Age Friendly City, Civic Participation and Employment)': False 'Contains(Age Friendly City, Communication and Information)': False 'Contains(Age Friendly City, Community support and health services)': False 'Contains(Age Friendly City, Housing)': True 'Contains(Age Friendly City, Outdoor Spaces and Buildings)': True 'Contains(Age Friendly City, Respect and Social Inclusion)': False 'Contains(Age Friendly City, Social Participation)': False 'Contains(Age Friendly City, Transport)': True 'Requires(Co-Production, Age Friendly City)': False 'Requires(Diversity, Age Friendly City)': False ... (2 more)	1-GED: 0.26 Segments: 101 Readability: 0.66 MMMG: 0.17
Ideogram V2			Entities: 'Age Friendly City': True 'Civic Participation and Employment': False 'Co-Production': False 'Communication and Information': False 'Community support and health services': False 'Diversity': False 'Equity': False 'Housing': True 'Outdoor Spaces and Buildings': True 'Respect and Social Inclusion': False ... (2 more)	Dependencies: 'Contains(Age Friendly City, Civic Participation and Employment)': False 'Contains(Age Friendly City, Communication and Information)': False 'Contains(Age Friendly City, Community support and health services)': False 'Contains(Age Friendly City, Housing)': True 'Contains(Age Friendly City, Outdoor Spaces and Buildings)': True 'Contains(Age Friendly City, Respect and Social Inclusion)': False 'Contains(Age Friendly City, Social Participation)': False 'Contains(Age Friendly City, Transport)': True 'Requires(Co-Production, Age Friendly City)': False 'Requires(Diversity, Age Friendly City)': False ... (2 more)	1-GED: 0.26 Segments: 169 Readability: 0.00 MMMG: 0.00
Infinity-BB			Entities: 'Age Friendly City': True 'Civic Participation and Employment': True 'Co-Production': False 'Communication and Information': True 'Community support and health services': True 'Diversity': False 'Equity': False 'Housing': True 'Outdoor Spaces and Buildings': True 'Respect and Social Inclusion': True ... (2 more)	Dependencies: 'Contains(Age Friendly City, Civic Participation and Employment)': True 'Contains(Age Friendly City, Communication and Information)': True 'Contains(Age Friendly City, Community support and health services)': True 'Contains(Age Friendly City, Housing)': True 'Contains(Age Friendly City, Outdoor Spaces and Buildings)': True 'Contains(Age Friendly City, Respect and Social Inclusion)': True 'Contains(Age Friendly City, Social Participation)': True 'Contains(Age Friendly City, Transport)': True 'Requires(Co-Production, Age Friendly City)': False 'Requires(Diversity, Age Friendly City)': False ... (2 more)	1-GED: 0.44 Segments: 214 Readability: 0.00 MMMG: 0.00
Seed-X			Entities: 'Age Friendly City': True 'Civic Participation and Employment': False 'Co-Production': False 'Communication and Information': False 'Community support and health services': True 'Diversity': False 'Equity': False 'Housing': True 'Outdoor Spaces and Buildings': True 'Respect and Social Inclusion': False ... (2 more)	Dependencies: 'Contains(Age Friendly City, Civic Participation and Employment)': False 'Contains(Age Friendly City, Communication and Information)': False 'Contains(Age Friendly City, Community support and health services)': True 'Contains(Age Friendly City, Housing)': True 'Contains(Age Friendly City, Outdoor Spaces and Buildings)': True 'Contains(Age Friendly City, Respect and Social Inclusion)': False 'Contains(Age Friendly City, Social Participation)': True 'Contains(Age Friendly City, Transport)': True 'Requires(Co-Production, Age Friendly City)': False 'Requires(Diversity, Age Friendly City)': False ... (2 more)	1-GED: 0.34 Segments: 86 Readability: 0.82 MMMG: 0.28

Figure 58: MMMG Benchmark visualization for seven representative models on a PhD-Sociology example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.6.8 History

Question: Design a comparative chart of ancient Greek and Roman political systems, focusing on governance, citizenship, and legal frameworks.

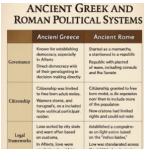
GPT-4o 			Entities: 'Ancient Greek Political System': True 'Ancient Roman Political System': True 'Assembly': False 'Citizens': False 'Citizenship': True 'Democracy': True 'Governance': True 'Laws': True 'Legal Frameworks': True 'Oligarchy': False .. (2 more)	Dependencies: 'Contains(Ancient Greek Political System, Democracy)': True 'Contains(Ancient Greek Political System, Oligarchy)': False 'Contains(Ancient Roman Political System, Republic)': True 'Contains(Ancient Roman Political System, Senate)': True 'Defines(Ancient Greek Political System, Governance)': True 'Defines(Ancient Roman Political System, Governance)': True 'Entails(Citizenship, Citizens)': False 'Entails(Legal Frameworks, Laws)': True 'Requires(Governance, Citizenship)': False 'Requires(Governance, Legal Frameworks)': False	1-GED: 0.59 Segments: 24 Readability: 1.00 MMMG: 0.59
FLUX-Reason (R1) 			Entities: 'Ancient Greek Political System': True 'Ancient Roman Political System': True 'Assembly': False 'Citizens': True 'Citizenship': True 'Democracy': True 'Governance': True 'Laws': True 'Legal Frameworks': True 'Oligarchy': False .. (2 more)	Dependencies: 'Contains(Ancient Greek Political System, Democracy)': True 'Contains(Ancient Greek Political System, Oligarchy)': False 'Contains(Ancient Roman Political System, Republic)': False 'Contains(Ancient Roman Political System, Senate)': False 'Defines(Ancient Greek Political System, Governance)': False 'Defines(Ancient Roman Political System, Governance)': False 'Entails(Citizenship, Citizens)': False 'Entails(Legal Frameworks, Laws)': True 'Requires(Governance, Citizenship)': False 'Requires(Governance, Legal Frameworks)': False	1-GED: 0.47 Segments: 63 Readability: 1.00 MMMG: 0.47
HiDream-11-full 			Entities: 'Ancient Greek Political System': False 'Ancient Roman Political System': False 'Assembly': False 'Citizens': False 'Citizenship': True 'Democracy': True 'Governance': True 'Laws': False 'Legal Frameworks': True 'Oligarchy': False .. (2 more)	Dependencies: 'Contains(Ancient Greek Political System, Democracy)': False 'Contains(Ancient Greek Political System, Oligarchy)': False 'Contains(Ancient Roman Political System, Republic)': False 'Contains(Ancient Roman Political System, Senate)': False 'Defines(Ancient Greek Political System, Governance)': False 'Defines(Ancient Roman Political System, Governance)': False 'Entails(Citizenship, Citizens)': False 'Entails(Legal Frameworks, Laws)': False 'Requires(Governance, Citizenship)': False 'Requires(Governance, Legal Frameworks)': False	1-GED: 0.22 Segments: 52 Readability: 1.00 MMMG: 0.22
FLUX1-1pro1 			Entities: 'Ancient Greek Political System': False 'Ancient Roman Political System': True 'Assembly': False 'Citizens': False 'Citizenship': True 'Democracy': False 'Governance': True 'Laws': False 'Legal Frameworks': True 'Oligarchy': False .. (2 more)	Dependencies: 'Contains(Ancient Greek Political System, Democracy)': False 'Contains(Ancient Greek Political System, Oligarchy)': False 'Contains(Ancient Roman Political System, Republic)': False 'Contains(Ancient Roman Political System, Senate)': False 'Defines(Ancient Greek Political System, Governance)': False 'Defines(Ancient Roman Political System, Governance)': False 'Entails(Citizenship, Citizens)': False 'Entails(Legal Frameworks, Laws)': False 'Requires(Governance, Citizenship)': False 'Requires(Governance, Legal Frameworks)': False	1-GED: 0.29 Segments: 17 Readability: 1.00 MMMG: 0.29
Ideogram V2 			Entities: 'Ancient Greek Political System': True 'Ancient Roman Political System': True 'Assembly': False 'Citizens': False 'Citizenship': True 'Democracy': False 'Governance': True 'Laws': False 'Legal Frameworks': True 'Oligarchy': False .. (2 more)	Dependencies: 'Contains(Ancient Greek Political System, Democracy)': False 'Contains(Ancient Greek Political System, Oligarchy)': False 'Contains(Ancient Roman Political System, Republic)': False 'Contains(Ancient Roman Political System, Senate)': False 'Defines(Ancient Greek Political System, Governance)': False 'Defines(Ancient Roman Political System, Governance)': False 'Entails(Citizenship, Citizens)': False 'Entails(Legal Frameworks, Laws)': False 'Requires(Governance, Citizenship)': False 'Requires(Governance, Legal Frameworks)': False	1-GED: 0.34 Segments: 163 Readability: 0.00 MMMG: 0.00
Infinity-BB 			Entities: 'Ancient Greek Political System': False 'Ancient Roman Political System': False 'Assembly': False 'Citizens': False 'Citizenship': False 'Democracy': False 'Governance': False 'Laws': False 'Legal Frameworks': False 'Oligarchy': False .. (2 more)	Dependencies: 'Contains(Ancient Greek Political System, Democracy)': False 'Contains(Ancient Greek Political System, Oligarchy)': False 'Contains(Ancient Roman Political System, Republic)': False 'Contains(Ancient Roman Political System, Senate)': False 'Defines(Ancient Greek Political System, Governance)': False 'Defines(Ancient Roman Political System, Governance)': False 'Entails(Citizenship, Citizens)': False 'Entails(Legal Frameworks, Laws)': False 'Requires(Governance, Citizenship)': False 'Requires(Governance, Legal Frameworks)': False	1-GED: 0.00 Segments: 80 Readability: 0.89 MMMG: 0.00
Seed-X 			Entities: 'Ancient Greek Political System': False 'Ancient Roman Political System': False 'Assembly': False 'Citizens': False 'Citizenship': False 'Democracy': False 'Governance': False 'Laws': False 'Legal Frameworks': False 'Oligarchy': False .. (2 more)	Dependencies: 'Contains(Ancient Greek Political System, Democracy)': False 'Contains(Ancient Greek Political System, Oligarchy)': False 'Contains(Ancient Roman Political System, Republic)': False 'Contains(Ancient Roman Political System, Senate)': False 'Defines(Ancient Greek Political System, Governance)': False 'Defines(Ancient Roman Political System, Governance)': False 'Entails(Citizenship, Citizens)': False 'Entails(Legal Frameworks, Laws)': False 'Requires(Governance, Citizenship)': False 'Requires(Governance, Legal Frameworks)': False	1-GED: 0.00 Segments: 70 Readability: 1.00 MMMG: 0.00

Figure 59: MMMG Benchmark visualization for seven representative models on a PhD-History example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.6.9 Philosophy

Question: Visualize a mind map that explores the relationship between philosophy and science, highlighting key debates and figures in the philosophy of science.

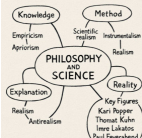
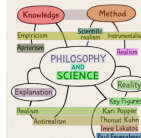
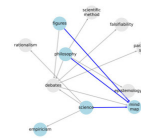
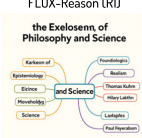
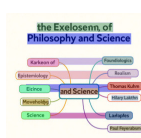
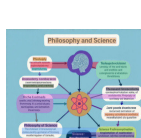
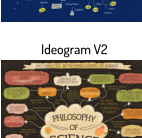
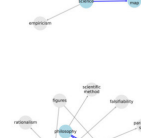
GPT-4o 			Entities: 'debates': False 'empiricism': True 'epistemology': True 'falsifiability': False 'figures': True 'mind map': True 'paradigm shift': False 'philosophy': True 'rationalism': False 'science': True ...(0 more)	Dependencies: 'Contains(debates, falsifiability)': False 'Contains(debates, paradigm shift)': False 'Contains(philosophy, epistemology)': False 'Contains(philosophy, scientific method)': False 'Contains(science, empiricism)': False 'Contains(science, rationalism)': False 'Entails(philosophy, debates)': False 'Entails(science, debates)': False 'Requires(debates, figures)': False 'Requires(mind map, debates)': False ...(3 more)	1-GED: 0.31 Segments: 19 Readability: 1.00 MMMG: 0.31
FLUX-Reason (R) 			Entities: 'debates': False 'empiricism': False 'epistemology': True 'falsifiability': False 'figures': True 'mind map': True 'paradigm shift': False 'philosophy': True 'rationalism': False 'science': True ...(0 more)	Dependencies: 'Contains(debates, falsifiability)': False 'Contains(debates, paradigm shift)': False 'Contains(philosophy, epistemology)': False 'Contains(philosophy, scientific method)': False 'Contains(science, empiricism)': False 'Contains(science, rationalism)': False 'Entails(philosophy, debates)': False 'Entails(science, debates)': False 'Requires(debates, figures)': False 'Requires(mind map, debates)': False ...(3 more)	1-GED: 0.34 Segments: 21 Readability: 1.00 MMMG: 0.34
HiDream-11-full 			Entities: 'debates': False 'empiricism': False 'epistemology': False 'falsifiability': False 'figures': False 'mind map': True 'paradigm shift': False 'philosophy': True 'rationalism': False 'science': True ...(0 more)	Dependencies: 'Contains(debates, falsifiability)': False 'Contains(debates, paradigm shift)': False 'Contains(philosophy, epistemology)': False 'Contains(philosophy, scientific method)': False 'Contains(science, empiricism)': False 'Contains(science, rationalism)': False 'Entails(philosophy, debates)': False 'Entails(science, debates)': False 'Requires(debates, figures)': False 'Requires(mind map, debates)': False ...(3 more)	1-GED: 0.34 Segments: 41 Readability: 1.00 MMMG: 0.34
FLUX.1-[pro] 			Entities: 'debates': True 'empiricism': False 'epistemology': False 'falsifiability': False 'figures': False 'mind map': True 'paradigm shift': False 'philosophy': True 'rationalism': False 'science': True ...(0 more)	Dependencies: 'Contains(debates, falsifiability)': False 'Contains(debates, paradigm shift)': False 'Contains(philosophy, epistemology)': False 'Contains(philosophy, scientific method)': False 'Contains(science, empiricism)': False 'Contains(science, rationalism)': False 'Entails(philosophy, debates)': False 'Entails(science, debates)': False 'Requires(debates, figures)': False 'Requires(mind map, debates)': True ...(3 more)	1-GED: 0.26 Segments: 67 Readability: 1.00 MMMG: 0.26
Ideogram V2 			Entities: 'debates': True 'empiricism': False 'epistemology': False 'falsifiability': False 'figures': False 'mind map': True 'paradigm shift': False 'philosophy': True 'rationalism': False 'science': True ...(0 more)	Dependencies: 'Contains(debates, falsifiability)': False 'Contains(debates, paradigm shift)': False 'Contains(philosophy, epistemology)': False 'Contains(philosophy, scientific method)': False 'Contains(science, empiricism)': False 'Contains(science, rationalism)': False 'Entails(philosophy, debates)': True 'Entails(science, debates)': True 'Requires(debates, figures)': False 'Requires(mind map, debates)': True ...(3 more)	1-GED: 0.30 Segments: 141 Readability: 0.21 MMMG: 0.06
Infinity-BB 			Entities: 'debates': False 'empiricism': False 'epistemology': True 'falsifiability': False 'figures': False 'mind map': True 'paradigm shift': False 'philosophy': True 'rationalism': False 'science': True ...(0 more)	Dependencies: 'Contains(debates, falsifiability)': False 'Contains(debates, paradigm shift)': False 'Contains(philosophy, epistemology)': True 'Contains(philosophy, scientific method)': False 'Contains(science, empiricism)': False 'Contains(science, rationalism)': False 'Entails(philosophy, debates)': False 'Entails(science, debates)': False 'Requires(debates, figures)': False 'Requires(mind map, debates)': False ...(3 more)	1-GED: 0.27 Segments: 228 Readability: 0.00 MMMG: 0.00
Seed-X 			Entities: 'debates': False 'empiricism': False 'epistemology': False 'falsifiability': False 'figures': False 'mind map': True 'paradigm shift': False 'philosophy': False 'rationalism': False 'science': False ...(0 more)	Dependencies: 'Contains(debates, falsifiability)': False 'Contains(debates, paradigm shift)': False 'Contains(philosophy, epistemology)': False 'Contains(philosophy, scientific method)': False 'Contains(science, empiricism)': False 'Contains(science, rationalism)': False 'Entails(philosophy, debates)': False 'Entails(science, debates)': False 'Requires(debates, figures)': False 'Requires(mind map, debates)': False ...(3 more)	1-GED: 0.08 Segments: 72 Readability: 0.98 MMMG: 0.08

Figure 60: MMMG Benchmark visualization for seven representative models on a PhD-Philosophy example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

F.6.10 Literature

Question: Create an infographic detailing the use of symbolism in modern literature, featuring examples from key authors.

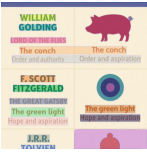
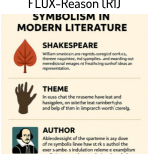
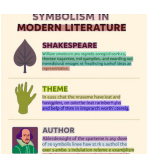
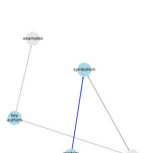
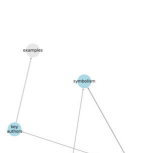
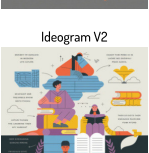
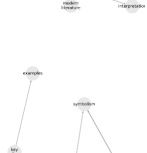
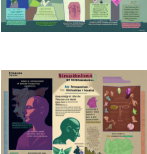
GPT-4o 			Entities: 'examples': True 'interpretation': True 'key authors': True 'modern literature': False 'symbolism': True	Dependencies: 'Contains(modern literature, symbolism)': False 'Defines(symbolism, interpretation)': True 'Entails(key authors, interpretation)': True 'Requires(examples, key authors)': True	1-GED: 0.44 Segments: 22 Readability: 1.00 MMMG: 0.44
FLUX-Reason (R1) 			Entities: 'examples': False 'interpretation': False 'key authors': True 'modern literature': True 'symbolism': True	Dependencies: 'Contains(modern literature, symbolism)': True 'Defines(symbolism, interpretation)': False 'Entails(key authors, interpretation)': False 'Requires(examples, key authors)': False	1-GED: 0.43 Segments: 23 Readability: 1.00 MMMG: 0.43
HiDream-11-full 			Entities: 'examples': False 'interpretation': False 'key authors': True 'modern literature': True 'symbolism': True	Dependencies: 'Contains(modern literature, symbolism)': True 'Defines(symbolism, interpretation)': False 'Entails(key authors, interpretation)': False 'Requires(examples, key authors)': False	1-GED: 0.43 Segments: 79 Readability: 0.90 MMMG: 0.39
FLUX1-[pro] 			Entities: 'examples': False 'interpretation': False 'key authors': True 'modern literature': False 'symbolism': True	Dependencies: 'Contains(modern literature, symbolism)': False 'Defines(symbolism, interpretation)': False 'Entails(key authors, interpretation)': False 'Requires(examples, key authors)': False	1-GED: 0.33 Segments: 30 Readability: 1.00 MMMG: 0.33
Ideogram V2 			Entities: 'examples': False 'interpretation': False 'key authors': False 'modern literature': False 'symbolism': False	Dependencies: 'Contains(modern literature, symbolism)': False 'Defines(symbolism, interpretation)': False 'Entails(key authors, interpretation)': False 'Requires(examples, key authors)': False	1-GED: 0.00 Segments: 133 Readability: 0.30 MMMG: 0.00
Infinity-8B 			Entities: 'examples': False 'interpretation': False 'key authors': False 'modern literature': False 'symbolism': False	Dependencies: 'Contains(modern literature, symbolism)': False 'Defines(symbolism, interpretation)': False 'Entails(key authors, interpretation)': False 'Requires(examples, key authors)': False	1-GED: 0.00 Segments: 160 Readability: 0.00 MMMG: 0.00
Seed-X 			Entities: 'examples': False 'interpretation': False 'key authors': False 'modern literature': False 'symbolism': False	Dependencies: 'Contains(modern literature, symbolism)': False 'Defines(symbolism, interpretation)': False 'Entails(key authors, interpretation)': False 'Requires(examples, key authors)': False	1-GED: 0.00 Segments: 77 Readability: 0.92 MMMG: 0.00

Figure 61: MMMG Benchmark visualization for seven representative models on a PhD-Literature example. Each row corresponds to one model and, from left to right, displays the generated image, its segmentation map, the reconstructed knowledge graph, the extracted entity and dependency lists, and finally the overall MMMG-Score along with its component sub-scores.

References