Writing as a Tool in Visualization Design

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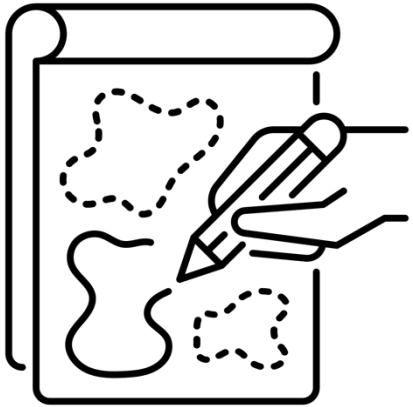
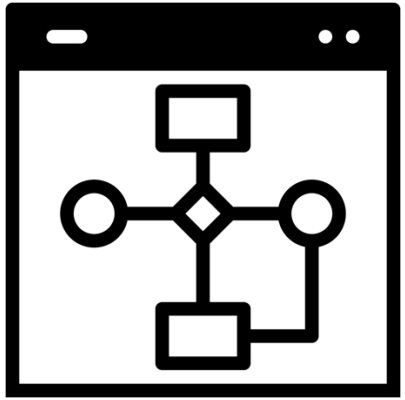
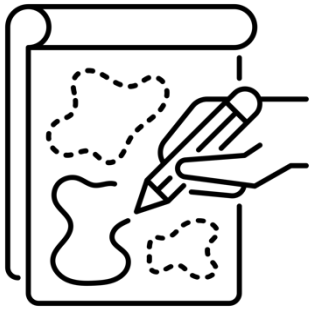
NSF EPIC



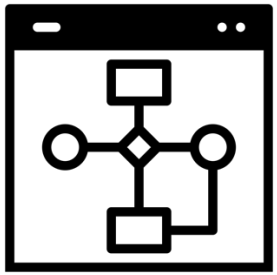


Visualization designers often sketch or wireframe their designs prior to implementing them.

Bako, H. K., Liu, X., Battle, L., & Liu, Z. (2022). Understanding How Designers Find and Use Data Visualization Examples. *IEEE Transactions on Visualization and Computer Graphics, 29*(1), 1048-1058.
Parsons, P. (2021). Understanding Data Visualization Design Practice. *IEEE Transactions on Visualization and Computer Graphics, 28*(1), 665-675.



Sketching



Wireframing

Writing

Writing, on the other hand, has been mostly overlooked as an element of design practice.

Russell, D. M. (2019). *The joy of search: A Google insider's guide to going beyond the basics*. MIT Press.

- Writing may help **novice designers** plan out and understand their visualizations
- Written content may help train chart creation models and support the **automation of basic design decisions**.
- Leveraging language as part of the design process may **increase opportunities for human-AI collaboration**.

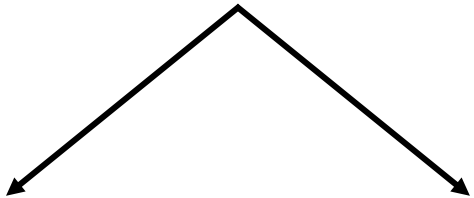
Writing

So, why do we care about writing in visualization design?

Shin, S., Hong, S., & Elmqvist, N. (2024). Visualizationary: Automating Design Feedback for Visualization Designers using LLMs. *IEEE Transactions on Visualization and Computer Graphics.*
Zhou, T., Huang, J., & Chan, G. Y. Y. (2024, May). Epigraphics: Message-Driven Infographics Authoring. In *Proceedings of the CHI Conference on Human Factors in Computing Systems* (pp. 1-18).

“Writing” as a tool

- **Writing Rudder**: hand-written or typed language created and/or used during the design process, describing the message, story, or key goals of the design itself



Study 1: Do designers use writing rudders in the design process?

Study 2: What is the impact of writing rudders on the design process?

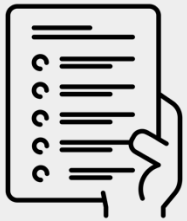
- Participants had to be:
  - Based in the US
  - Fluent in English
  - Designing visualizations as part of a *paid* role.

Study 1

Study 2

N = 24

Pre-Survey

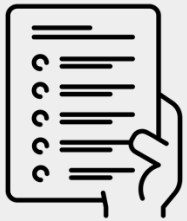


- Work practices
- Design tools
- Demographics

Industry	Count
Journalism	5
Manufacturing	4
Scientific or Technical Services	4
Medical	3
Nonprofit and Government	3
Software	3
Research	2

N = 24

Pre-Survey



- Work practices
- Design tools
- Demographics

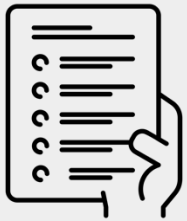
Tools	Count
Excel	18
Tableau	13
R	10
PowerPoint	10
Power BI	10
Adobe Illustrator	10
Figma	9
D3.js	6

Study 1

Study 2

N = 24

Pre-Survey



- Work practices
- Design tools
- Demographics

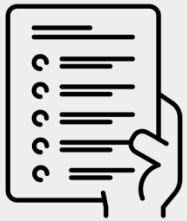
Design Outcomes	Count
Dashboards	13
Text + Visual Reports	10
Live Presentations	10
Stand-alone Charts	7
Enterprise Applications	4

Study 1

Study 2

N = 24

Pre-Survey



- Work practices
- Design tools
- Demographics

Interview

Design Process

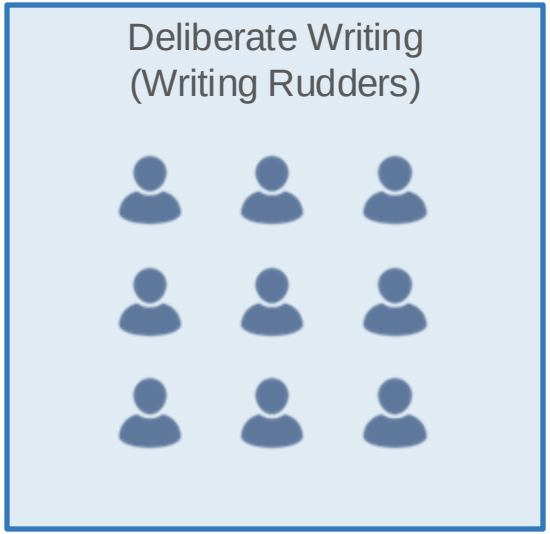
Example Design

Text Elements

“Writing Rudder”

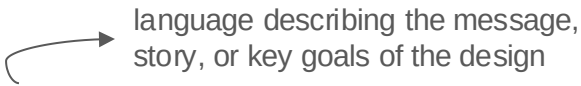
Study 1

Study 2



McKenna, S., Mazur, D., Agutter, J., & Meyer, M. (2014). Design Activity Framework for Visualization Design. *IEEE Transactions on Visualization and Computer Graphics*, *20*(12), 2191-2200.

- 11 participants used writing to **understand** the key questions the design would be used to answer.
- 7 participants used writing to **ideate** different ways to address the needs of the design.



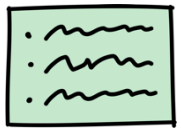
Do designers use writing rudders in the design process?

1. Most designers do **not** use writing rudders in the design process.

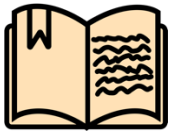
2. If designers do use writing rudders, they are mostly used in the **early** stages of the design process.

What is the impact of writing rudders on the design process?

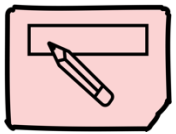
Key Questions



Possible Conclusions



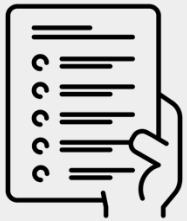
Narrative or Story



Possible Titles

N = 15

Pre-Survey

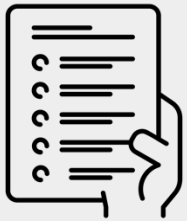


- Work practices
- Design tools
- Demographics

Industry	Count
Research	5
Nonprofit and Government	4
Journalism	3
Scientific or Technical Services	1
Medical	1
Software	1

N = 15

Pre-Survey

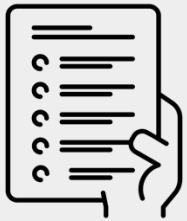


- Work practices
- Design tools
- Demographics

Tools	Count
Excel	9
Adobe Illustrator	9
Tableau	6
PowerPoint	4
R	3
Figma	3

N = 15

Pre-Survey



- Work practices
- Design tools
- Demographics

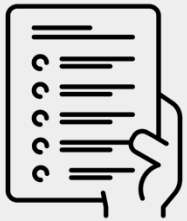
Design Outcomes	Count
Text + Visual Reports	10
Stand-alone Charts	10
Dashboards	6
Live Presentations	4
Enterprise Applications	1

Study 1

Study 2

N = 15

Pre-Survey



- Work practices
- Design tools
- Demographics

Interview

Design Process

Design Exercise

Study 1

Study 2

Exercise Overview

Overall Goal:

Identify relevant Chicago weather trends to inform marketing strategy for waterproof windbreakers.

Specific considerations:

Advertisement should begin 1 month before peak use.

Audience:

Marketing strategists

1. Familiarize yourself with the data

Take a second to look at the Data tab and familarize yourself with the data itself. Ask the interviewer any questions you may have about the data and the task.

- Demographics

Interview

2. Complete the writing step

Before designing the visualization, write a list of possible questions that a user may address with the visualization or set of visualizations that you plan to make. Feel free to use your imagination. No answer is right or wrong.

Write one key question that a user may use the design to address.

Write another key question that a user may use the design to address.

Write a third key question that a user may use the design to address.

3. Design!

Process

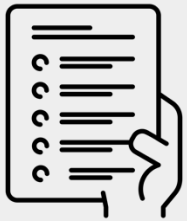
Exercise

Study 1

Study 2

N = 15

Pre-Survey



- Work practices
- Design tools
- Demographics

Interview

Design Process

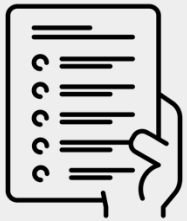
Design Exercise

Reflections

Study 1

Study 2

Pre-Survey



- Work practices
- Design tools
- Demographics

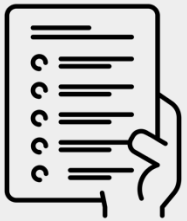
Interview

Design Process

Design Exercise

Reflections

Post-Survey

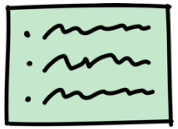


Rated each variant for its impact on the design process

Key Questions

N = 8

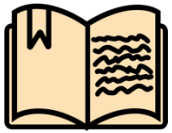
“When is the weather in Chicago the worst and a windbreaker is required?” [P107]



Possible Conclusions

N = 5

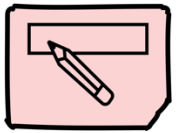
“The month of X is the wettest month... therefore a good idea to start campaign 30 days prior.” [P110]



Narrative or Story

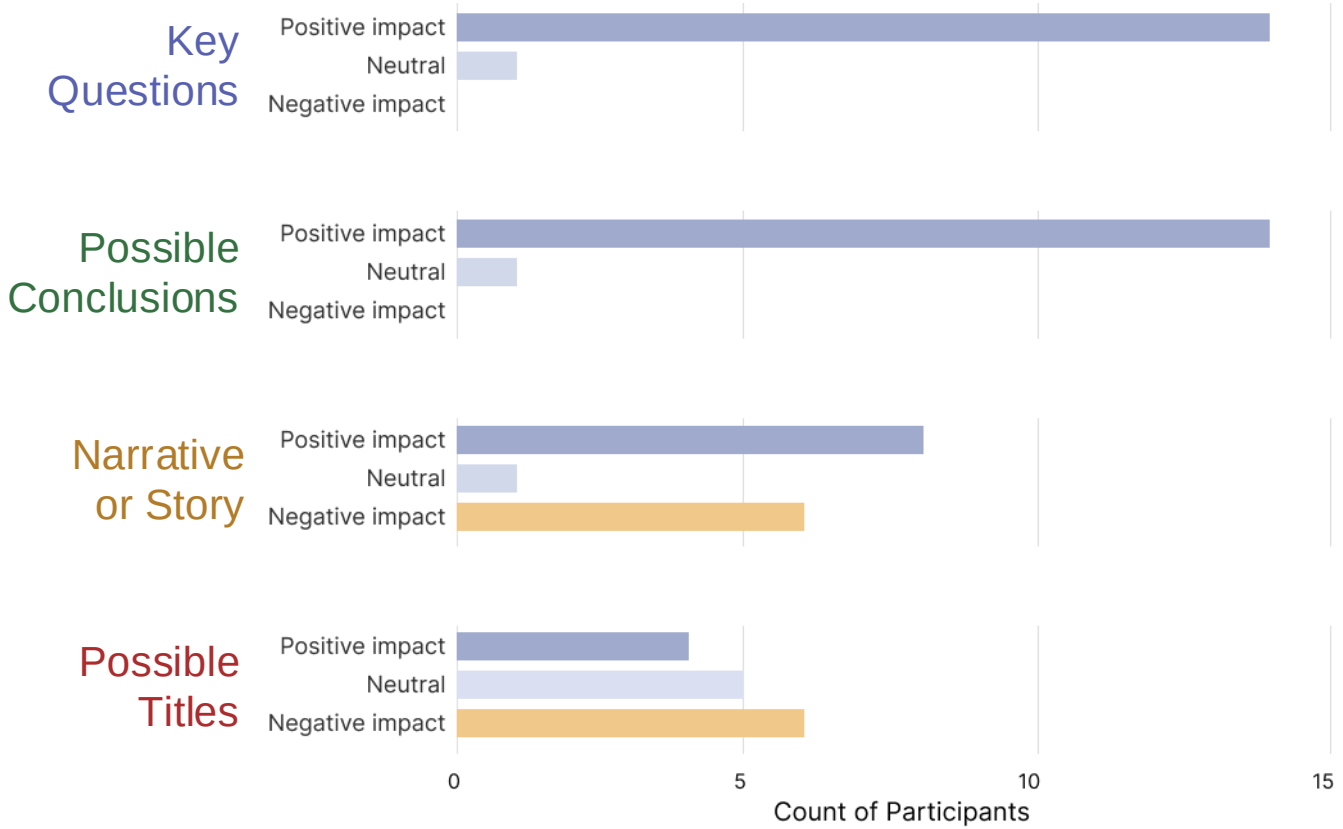
N = 2

“Weather is related to purchasing of rainwear... By analysis of weather records, we can see...” [P105]

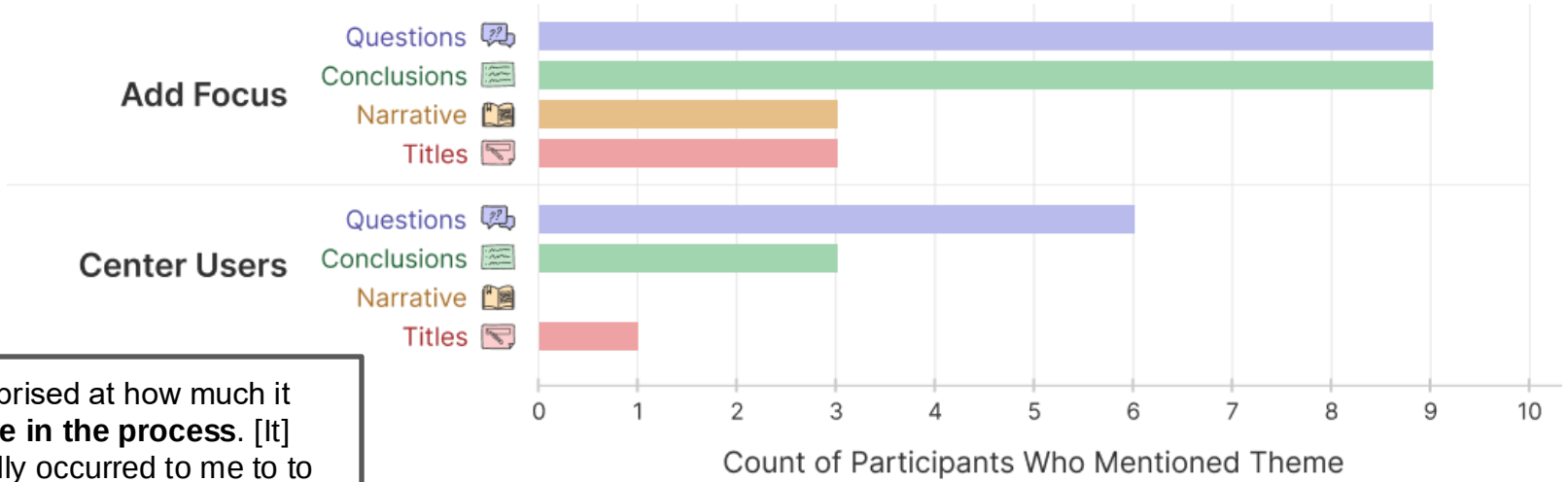


Possible Titles

N = 0


Key Questions
Positive impact
Neutral
Negative impact
Possible Conclusions
Positive impact
Neutral
Negative impact
Narrative or Story
Positive impact
Neutral
Negative impact
Possible Titles
Positive impact
Neutral
Negative impact
0
5
10
15
Count of Participants

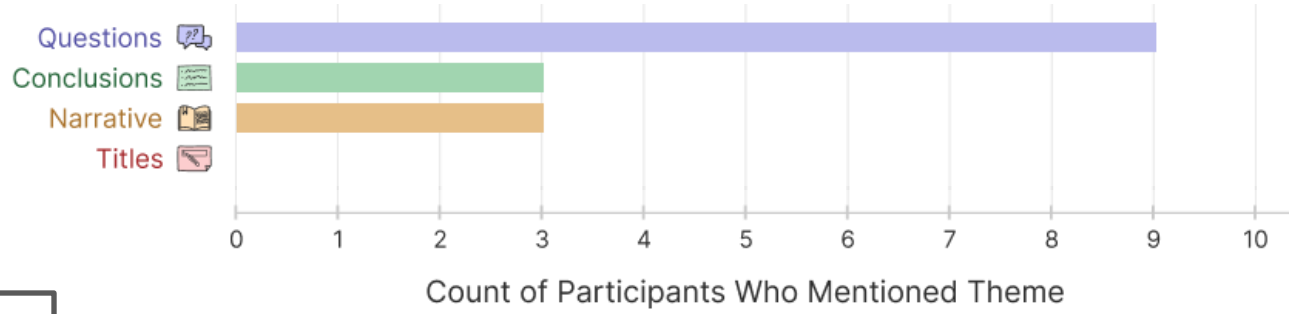
Key questions and possible conclusions lead to a more user-centered, focused design process.



"I was surprised at how much it **guided me in the process**. [It] hadn't really occurred to me to to do it like that before. And I feel like **it helped me stay really focused**." [P110]

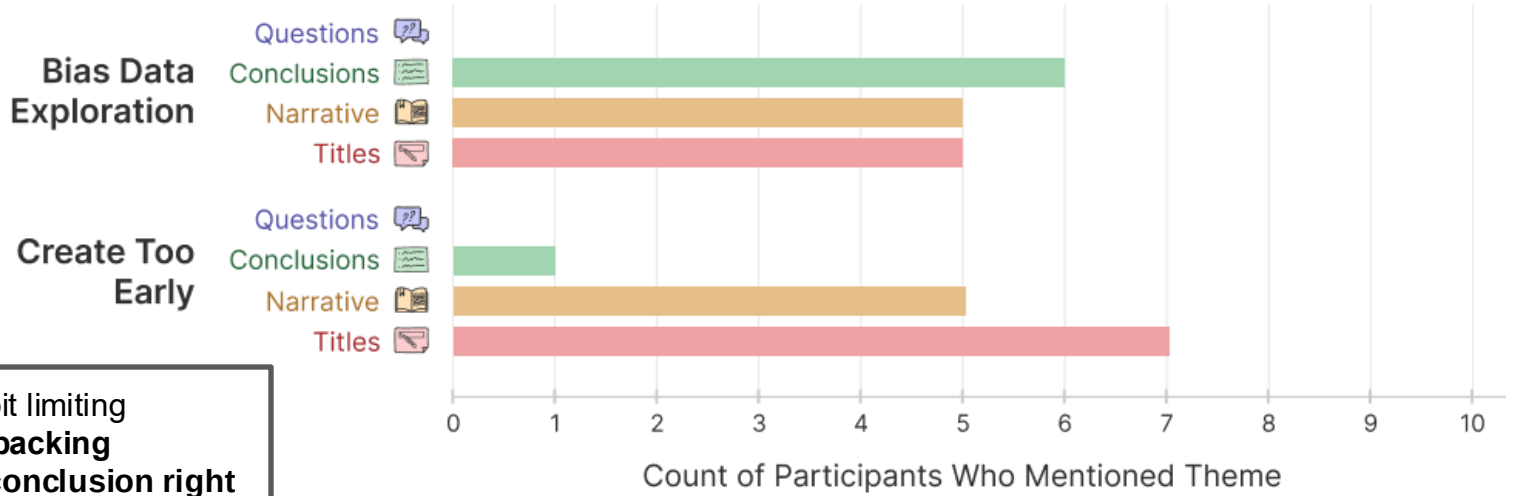
Key questions and other rudders could serve as evaluation criteria for the final design.

Evaluate and Discuss Design



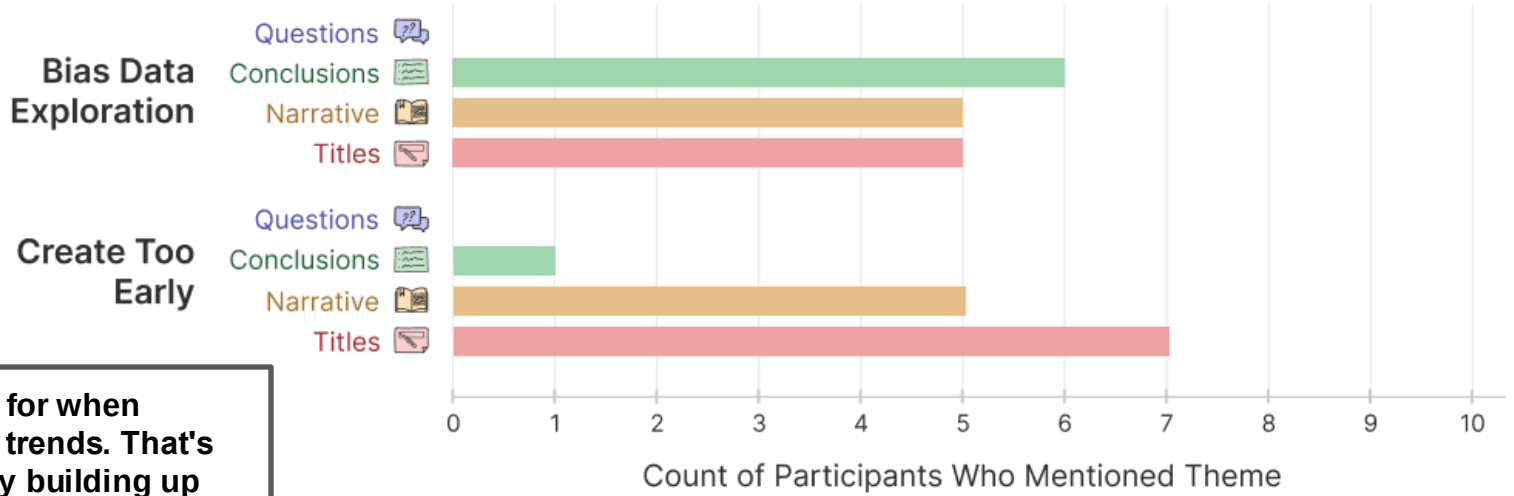
"The end of the project comes, and... I'm like '**Does it match the questions?**' And then [the client] would just verbally have a conversation. '**Do you remember those questions that we set out? I think we're answering those**.'" [P104]

Stating outcomes may bias the data exploration stage of design, causing concern.



"Titles can be a bit limiting because **you're backing yourself into a conclusion right away** rather than trying to gather up what you have and see how it fits." [P111]

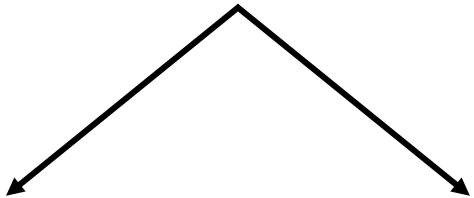
Stating outcomes may bias the data exploration stage of design, causing concern.



"I like **[narrative] for when you've seen the trends. That's how you're really building up your case and sharing it**. But I think grounding it in the question we're answering." [P101]

“Writing” as a tool

- **Writing Rudder**: hand-written or typed language created and/or used during the design process, describing the message, story, or key goals of the design itself

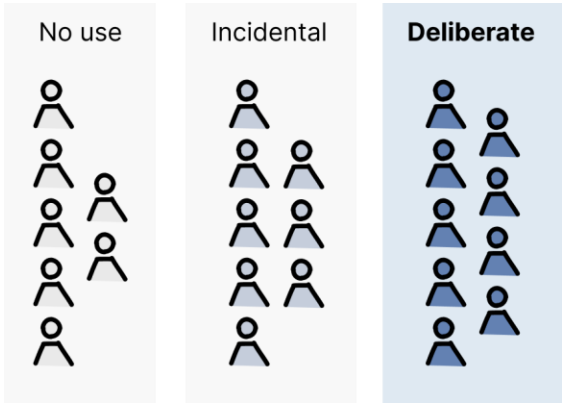


Study 1: Do designers use writing rudders in the design process?

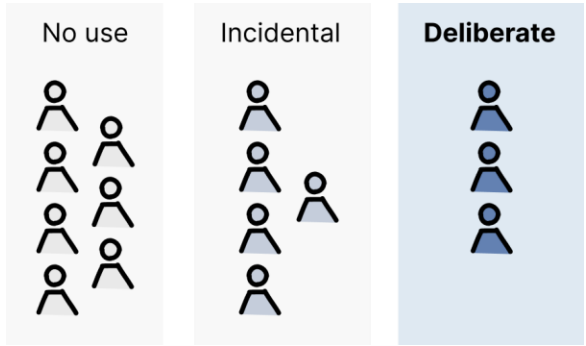
Study 2: What is the impact of writing rudders on the design process?

Writing is not **currently** a consistent step in the visualization design process.

Study 1

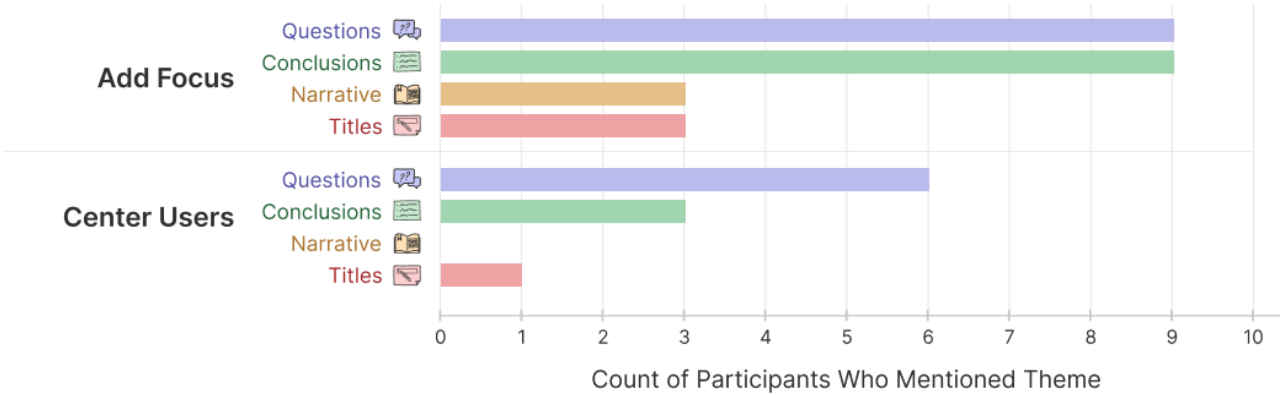


Study 2



Writing is not **currently** a consistent step in the visualization design process.

Introducing the simple writing rudder intervention can **focus the design process on user needs and perspectives**.



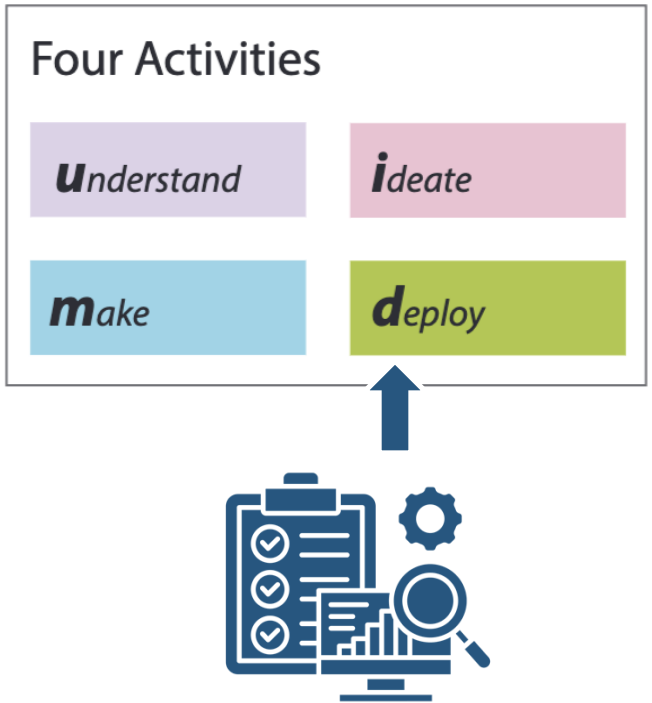
Writing is not **currently** a consistent step in the visualization design process.

Introducing the simple writing rudder intervention can **focus the design process on user needs and perspectives**.

There are many important areas of **future work** which further explore how writing as a tool for visualization design.

Future Work

Evaluation of impact
of writing rudders on resulting designs



Future Work

Evaluation of impact of writing rudders on resulting designs

Writing rudders as an **educational tool** for visualization design.

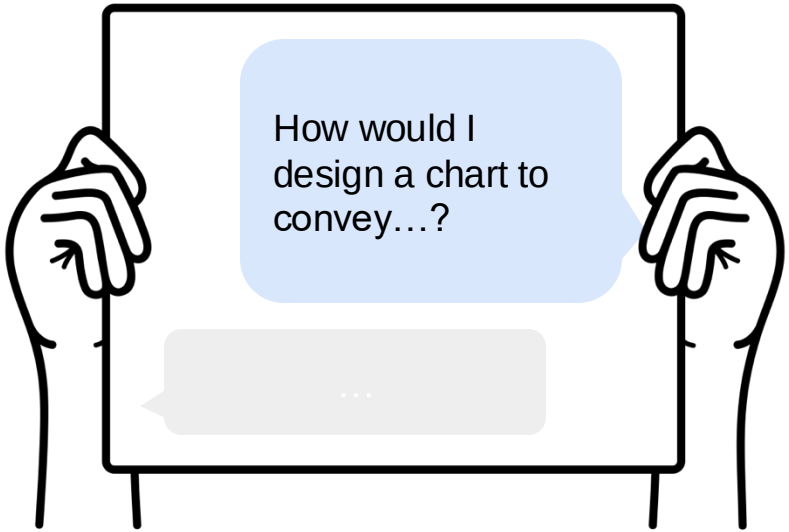
Future Work

Evaluation of impact of writing rudders on resulting designs

Writing rudders as an **educational tool** for visualization design.

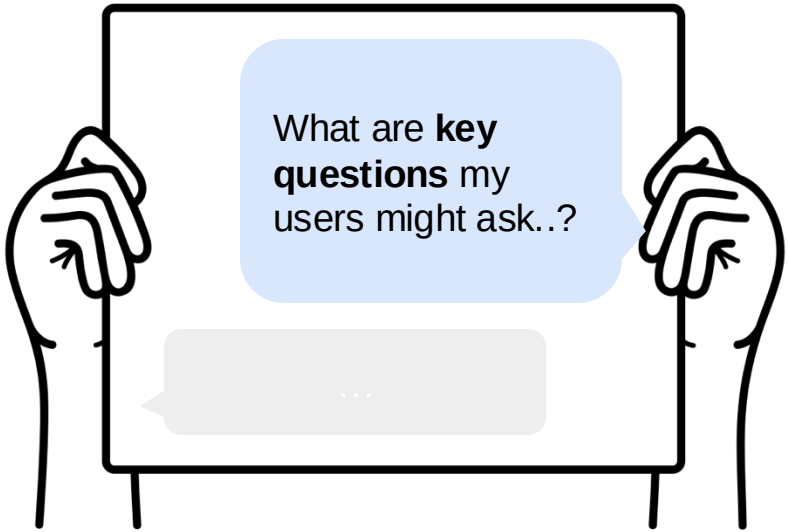
AI-supported design tools and workflows

Future Work



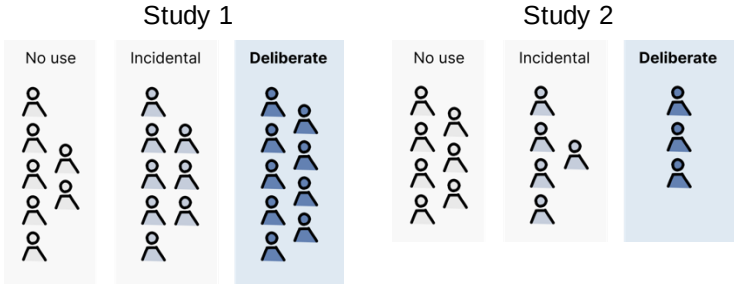
AI-supported design tools and workflows

Future Work

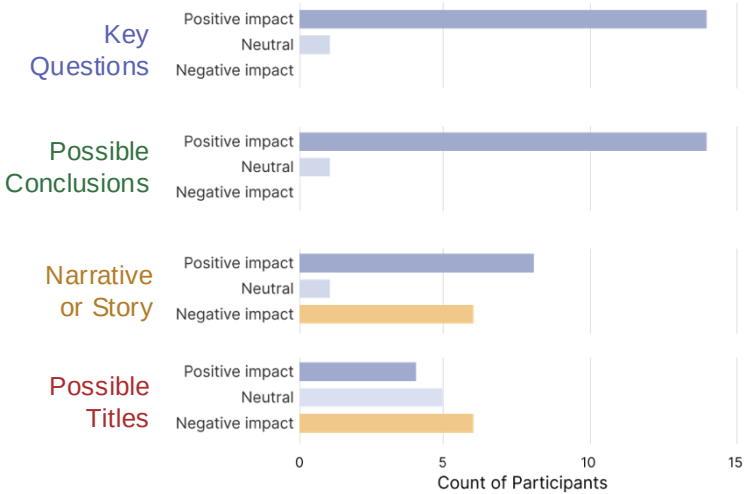


AI-supported design tools and workflows

Only one third of participants used writing **deliberately** as a design step.



Key questions and possible conclusions were seen as having a strong positive impact on design processes.



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Clara Hu

Marti Hearst