

Voice Interaction with Conversational AI Could Facilitate Thoughtful Reflection and Substantive Revision in Writing



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Example Writing Center Tutoring Session

Tutor: “Glad you came in today. What are we working on together?”

Student: “I have this essay for my sociology class; it’s about community gardens. I just... feel like it’s all over the place.”

[...]

Tutor: “Mind if we start by talking through your main point, just in your own words?”

Student: “Sure. I’m trying to say that community gardens are helpful in cities because they improve access to fresh food and bring people together.”

[...]

Tutor: “Now, have you thought about any challenges or counterpoints people might bring up about community gardens?”

Student: “Um... maybe that not everyone has time to participate? Or that gardens could get neglected?”

Motivation

- Substantive revision is driven by **reflection**, which helps writers view their work from an external perspective and align it with their communication goals.
- Conversations with tutors in writing centers can naturally foster reflection by engaging writers in dialogue.
- Speech is generally more expressive and imposes a lower cognitive load than writing, potentially freeing cognitive resources for writers to engage in both reflection and revision.
- Advances in multimodal large language models, such as GPT-4o and Gemini 2.0, now enable users to use both text and speech for a reflective dialogue with AI.
- **However, there is limited evidence on how the input modality (text vs. speech) affects the quality of reflection and subsequent revision.**

Conditions: Voice Communication with AI

Six Thinking Hats was written by Dr. Edward de Bono. "Six Thinking Hats" and the associated idea of parallel thinking provide a means for groups to plan thinking processes in a detailed and cohesive way, and in doing so to think together more effectively.

44 words



Could you tell me about what you are working on today?

Here is the user's current document:

Six Thinking Hats was written by Dr. Edward de Bono. "Six Thinking Hats" and the associated idea of parallel thinking provide a means for groups to plan thinking processes in a detailed and cohesive way, and in doing so to think together more effectively.

This is the user's response of the question "Could you tell me about what you are working on today?":

▶ 0:00 / 0:23 🔊 ⋮

Yes, I think I could induce the readers to think about the last time they were part of a group project. I'm working on writing a piece about a group thinking technique developed by Dr. Edward Dugano.



That sounds like an interesting topic! How do you plan to connect the readers' experiences with group projects to Dr. Edward de Bono's Six Thinking Hats technique?

▶ 0:00 / 0:13 🔊 ⋮

I think I might start my next sentence to sort of ask the readers to think about the last time they were part of a group project and imagine how they came up with ideas as a group.



That's a great approach. How do you think reflecting on their own experiences will help readers better understand the benefits of the Six Thinking Hats technique?

🗨 Start Talking

🗑 Discard

Conditions: Written Communication with AI

Six Thinking Hats was written by Dr. Edward de Bono. "Six Thinking Hats" and the associated idea of parallel thinking provide a means for groups to plan thinking processes in a detailed and cohesive way, and in doing so to think together more effectively.

44 words



Could you tell me about what you are working on today?

Here is the user's current document:

Six Thinking Hats was written by Dr. Edward de Bono. "Six Thinking Hats" and the associated idea of parallel thinking provide a means for groups to plan thinking processes in a detailed and cohesive way, and in doing so to think together more effectively.

This is the user's response of the question "Could you tell me about what you are working on today?":

I am writing about group thinking method developed by Edward de Bono called six thinking hats. I am trying to describe how this method helps a group of people to think collectively.



That sounds like an interesting topic! How do you plan to illustrate the impact of the Six Thinking Hats method on group dynamics and decision-making? Are there any specific examples or scenarios you intend to include?

Yes, I think I could induce the readers to think about the last time they were part of a group project and imagine how they came up with ideas as a group



That's a great approach! Encouraging readers to reflect on their own experiences can make your writing more relatable. How do you think the Six Thinking Hats method would differ from their usual group brainstorming sessions? Are there particular aspects of the method that you think would stand out to them?

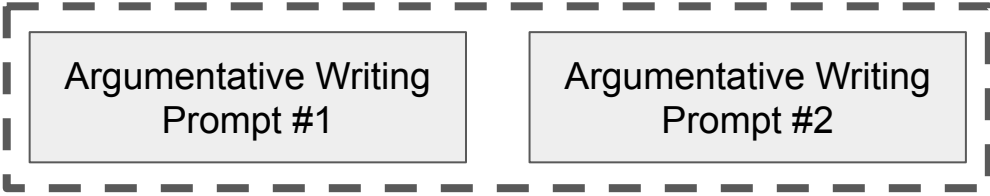
Type a message...

Send

Methodology

- **Experiment:** Within-subjects study.
 - **Conditions:**
 - Voice communication with AI.
 - Written communication with AI.
- **Participants:** Recruited from Calvin University and crowdsourcing platforms.

Task: Homework



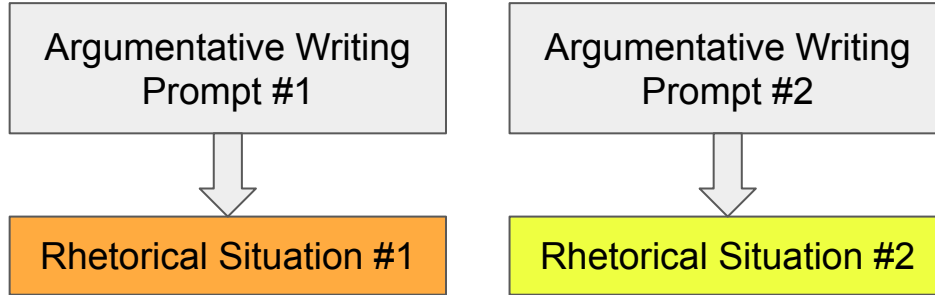
Argumentative Writing
Prompt #1

Argumentative Writing
Prompt #2

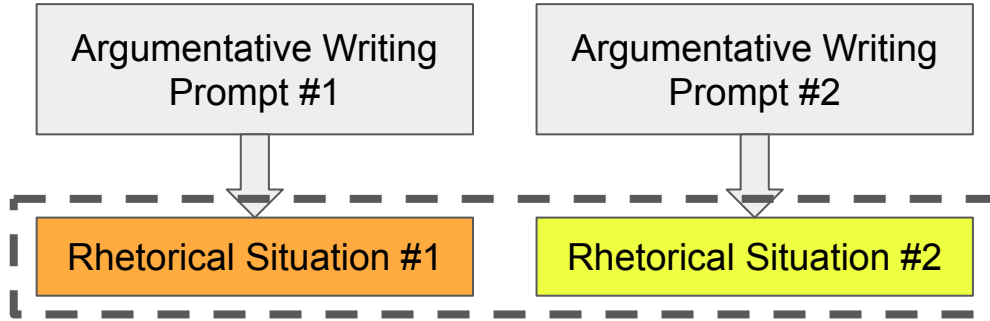
“Does technology in the classroom ever get in the way of learning?”

“What Do You Think of Grouping Students by Ability in Schools?”

Task: Homework



Task: Homework



Rhetorical Situation #1

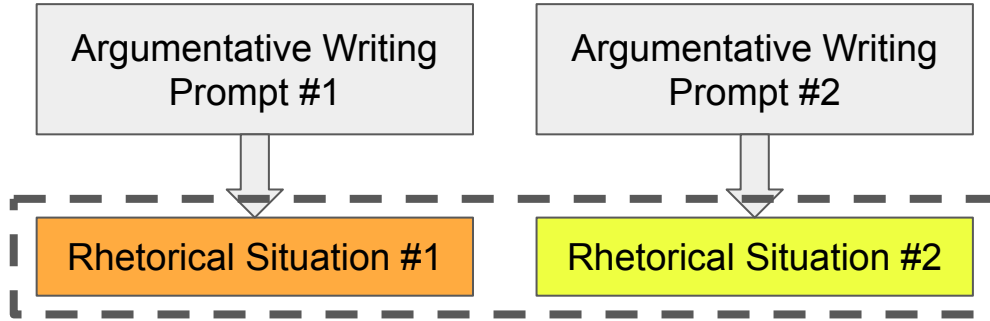
Writer: A high school teacher.

Audience: Education policymakers.

Purpose: To persuade decision-makers to adopt or abandon certain school policies based on observed outcomes.

Exigence: A recent discussion on introducing a law that will affect school policies.

Task: Homework



Rhetorical Situation #2

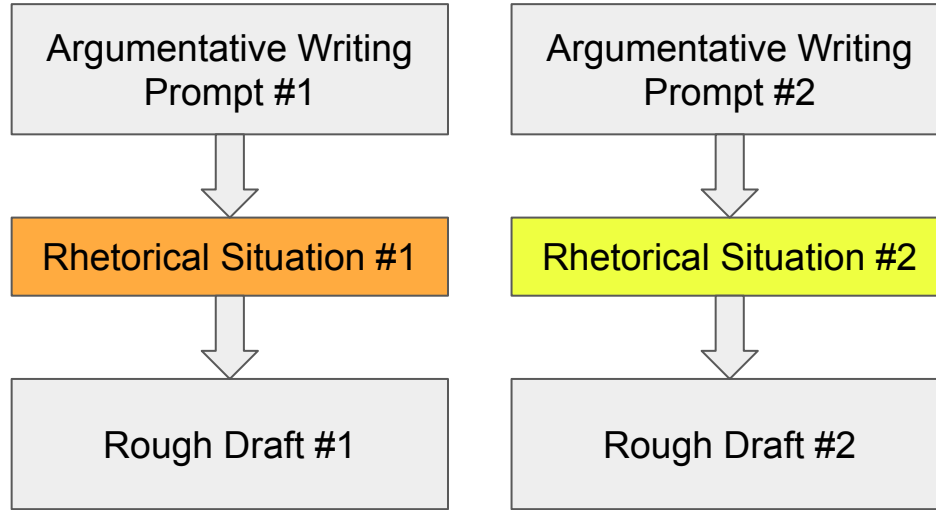
Writer: A school parent.

Audience: Other school parents.

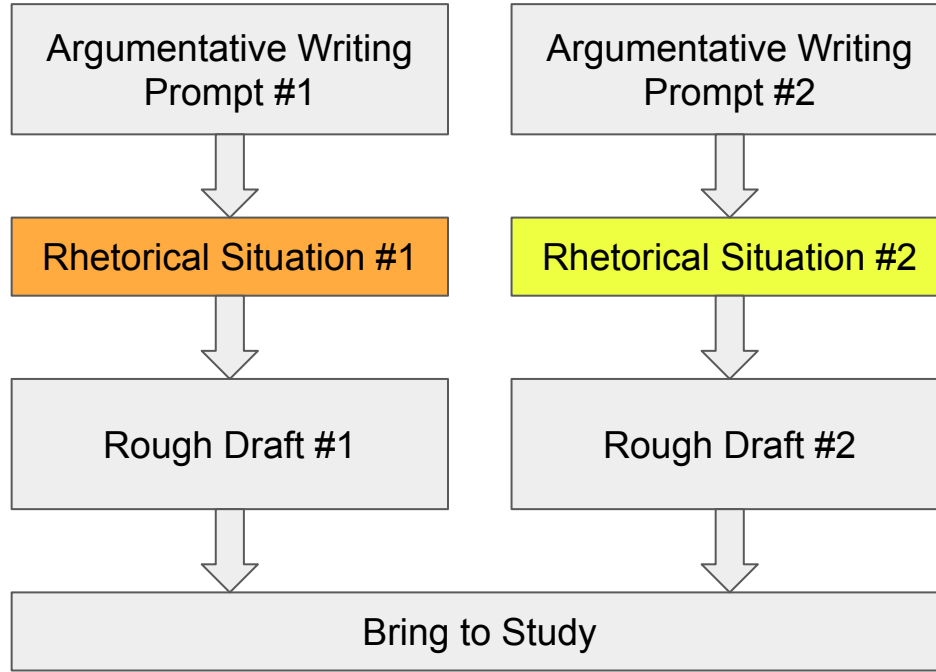
Purpose: To persuade other parents to advocate for certain school policies based on observed outcomes.

Exigence: The impact of certain school policies on your child's learning.

Task: Homework



Task: Homework



Task: Study

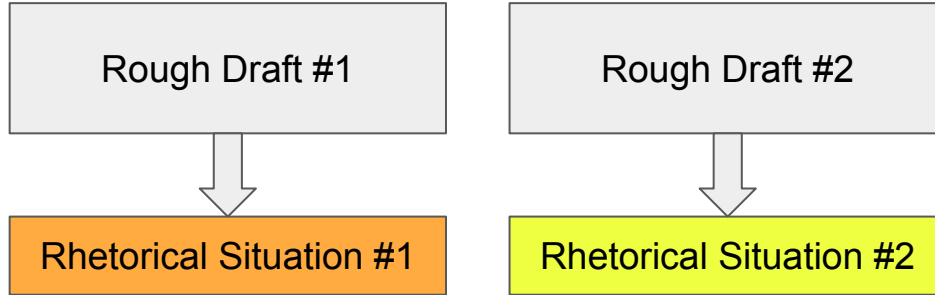
Rough Draft #1



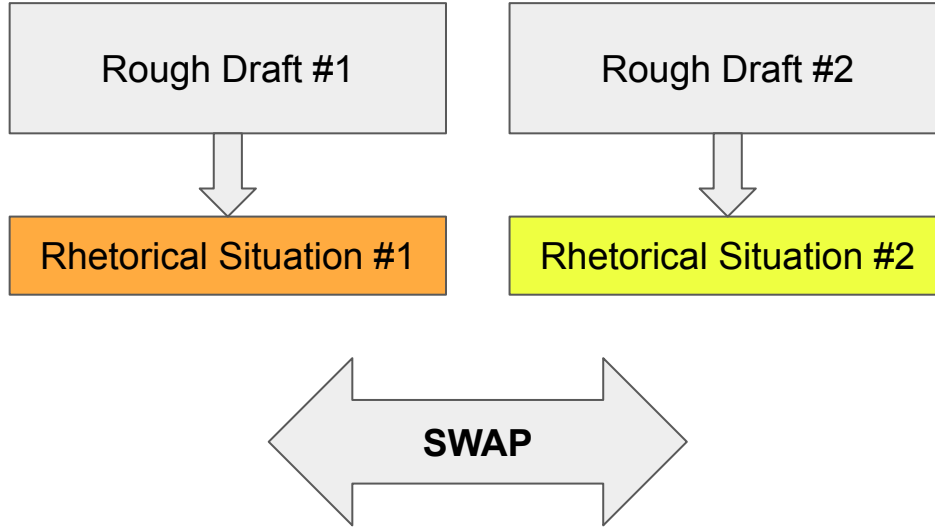
Rough Draft #2



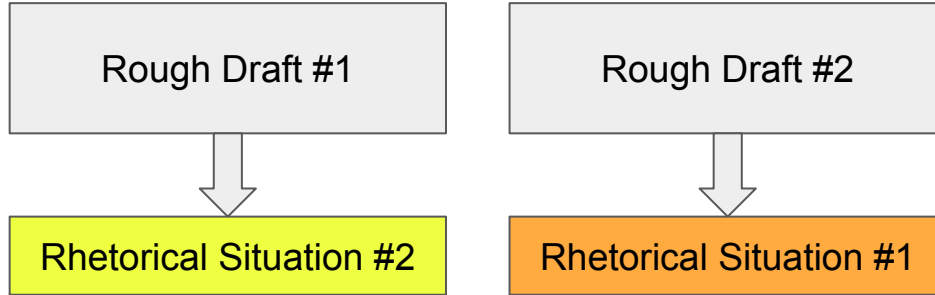
Task: Study



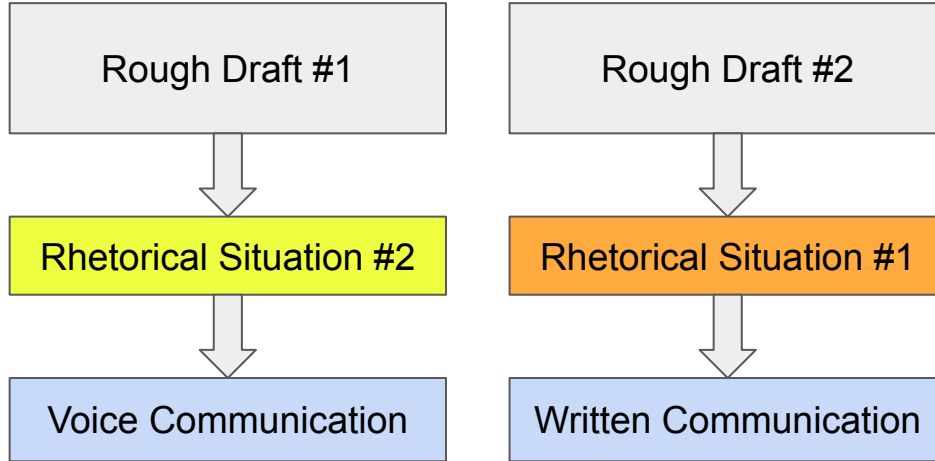
Task: Study



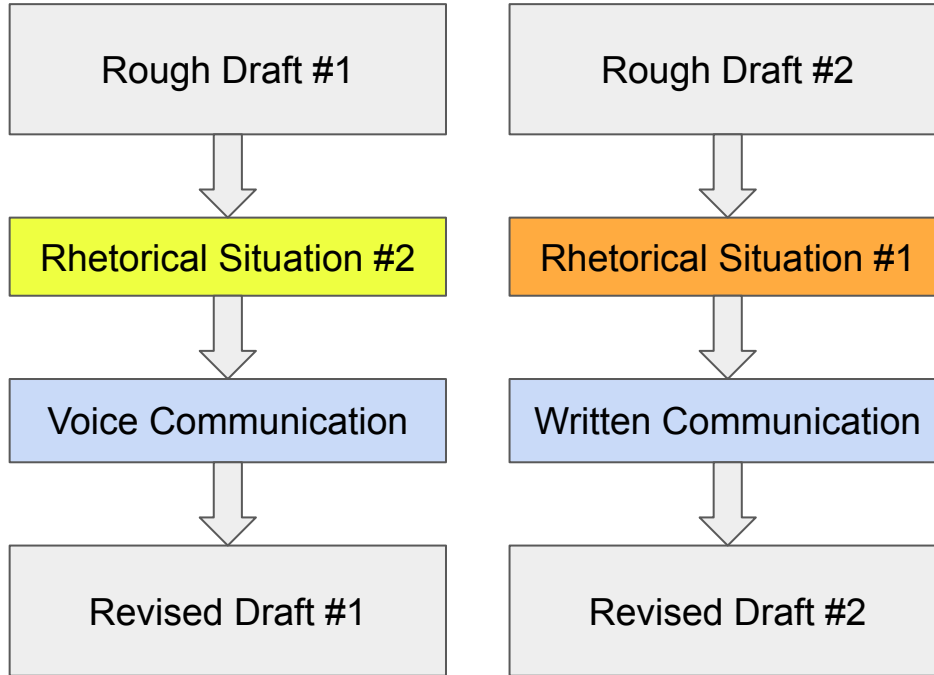
Task: Study



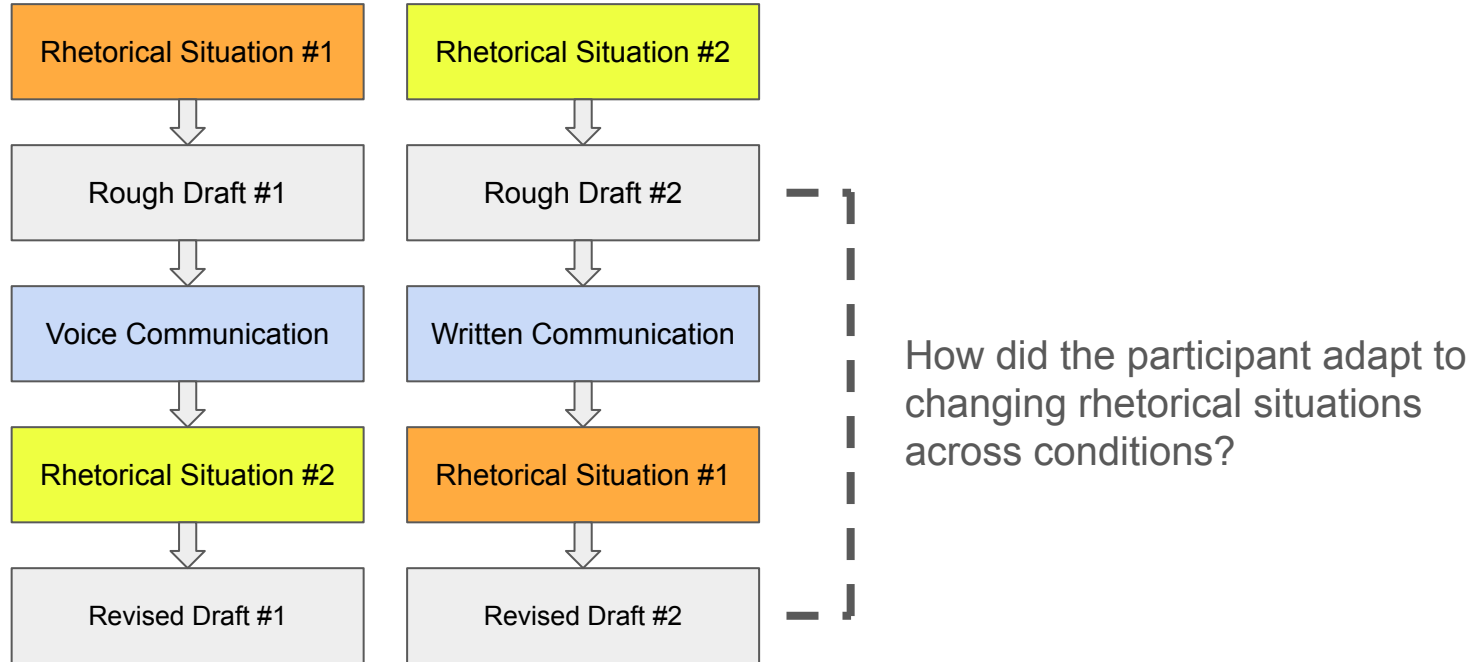
Task: Study



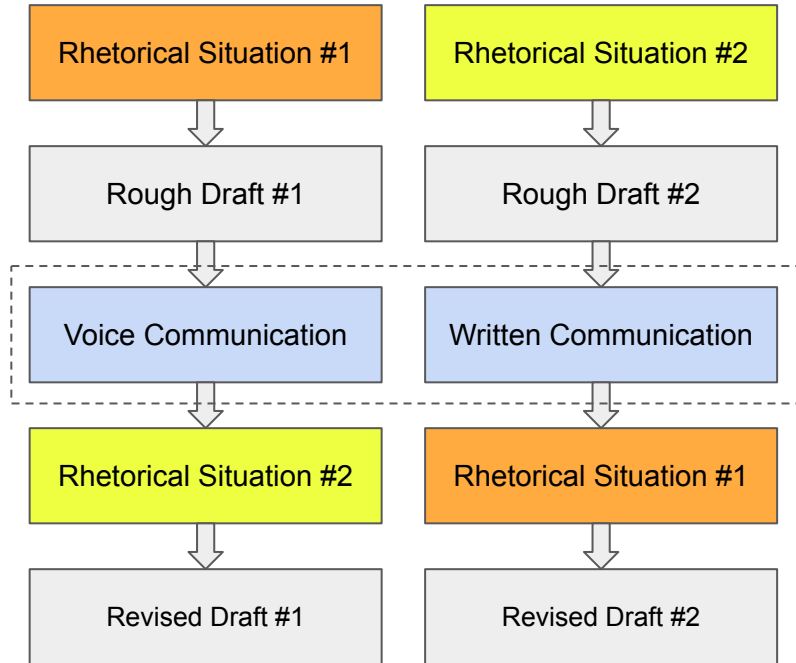
Task: Study



Measures: Adapting to Different Rhetorical Situation

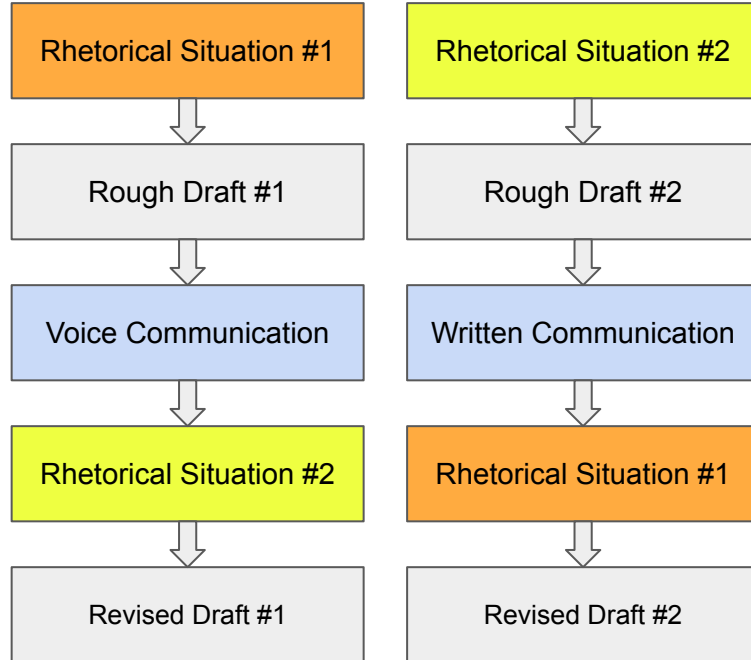


Measures: Cognitive Load (using NASA-TLX)



How did the participant perceive the cognitive load of revising under each conditions?

Measures: Final Outcome



Rubric for the Assessment of the Argumentative Essay					
	3	2	1	0	Score
A. Introduction Background/history Define the problem Thesis Statement	Well developed introductory paragraph contains detailed background, a clear explanation or definition of the problem, and a thesis statement	Introductory paragraph contains some background information and states the problem, but does not explain using details. States the thesis of the paper.	Introduction states the thesis but does not adequately explain the background of the problem. The problem is stated, but lacks detail.	Thesis and/or problem is vague or unclear. Background details are a seemingly random collection of information, unclear, or not related to the topic.	
Conclusion	Conclusion summarizes the main topics without repeating previous sentences, writer's opinions and suggestions for change are logical and well thought out.	Conclusion summarizes main topics. Some suggestions for change are evident.	Conclusion summarizes main topics, but is repetitive. No suggestions for change and/or opinions are included.	Conclusion does not adequately summarize the main points. No suggestions for change or opinions are included.	
B. MAIN POINTS Body Paragraphs Refutation	Three or more main points are well developed with supporting details. Refutation paragraph(s) acknowledges the opposing view and summarizes their main points.	Three or more main points are present but may lack detail and development in one or two. Refutation paragraph(s) acknowledges the opposing view but doesn't summarize points.	Three or more main points, but all lack development. Refutation paragraph(s) missing and/or vague	Less than three main points, with poor development of ideas. Refutation missing or vague.	
C. ORGANIZATION	Logical, compelling progression of ideas in essay; clear structure which enhances and showcases the central idea or theme and moves the reader through the text. Organization flows so smoothly the reader hardly thinks about it. Effective, mature, graceful transitions exist throughout the essay.	Overall, the paper is logically developed. Progression of ideas in essay makes sense and moves the reader easily through the text. Strong transitions exist throughout and add to the essay's coherence	Progression of ideas in essay is awkward, yet moves the reader through the text without too much confusion. The writer sometimes lunges ahead too quickly or spends too much time on details that do not matter. Transitions appear sporadically, but not equally throughout the essay.	Arrangement of essay is unclear and illogical. The writing lacks a clear sense of direction. Ideas, details or events seem strung together in a loose or random fashion; there is no identifiable internal structure and readers have trouble following the writer's line of thought. Few, forced transitions in the essay or no transitions are present.	
D. WORKS CITED	Source material is smoothly integrated into the text. All sources are accurately documented in the desired format both in the text and on the Works Cited page.	Source material is used. All sources are accurately documented, but a few are not in the desired format. Some sources lack credibility.	Source material is used, but integration may be awkward. All sources are accurately documented, but many are not in the desired format or lack credibility.	Lacks sources and/or sources are not accurately documented. Format is incorrect for all sources.	
E. MECHANICS Sentence Structure Punctuation & Capitalization	Sentence structure is correct. Punctuation and capitalization are correct.	Sentence structure is generally correct. Some awkward sentences do appear. There are one or two errors in punctuation and/or capitalization.	Work contains structural weaknesses and grammatical errors. There are three or four errors in punctuation and/or capitalization.	Work contains multiple incorrect sentence structures. There are four or more errors in punctuation and/or capitalization.	
TOTAL					

Comments:

Grade Equivalent: A= 13 - 15 points
B= 10 - 12 points
C= 7 - 9 points
D= 4 - 6 points
F= 3 or less

Grade: _____



How did the participant revise their draft across conditions?

Measures: Others

- Engagement metrics (turns per minute, response time).
- Post-study interaction log semi-structured interview.

Pilot Study Results (N=1)

- Voice communication with AI was more “wordy,” reflections were much more “expressive,” “freeform,” and “exploratory.”
- Written communication with AI was more “concise,” reflections were much more carefully thought out.

Expected Contributions

- Insight into how modality affects reflection with AI.
- Design implications for intelligent writing tools.
- Framework for transforming static LLM feedback into dynamic, voice-based conversation.

Design Norms

- **Cultural Appropriateness:**

- **Potential harm when neglected:** Displacement of human writing with AI writing.
- **Current trade-off:** Encouraging human-AI conversations instead of face-to-face conversations with other people.

- **Caring:**

- **Potential harm when neglected:** Less reflection on considering another person's perspective when using AI for written communication.
- **Current trade-off:** May support internal reflection more than actual reflection on another person's perspective (you are talking to AI, afterall).