Brainstorming with an LLM Student Activity

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Blog post: https://duke.is/ksm-llm-brainstorm-blog
Link to slides: https://duke.is/ksm-llm-brainstorm-slides

Context - CompSci 216 *Everything Data*

- Post-CS2 data science elective course
- Enrollment: 70-120 students
- Semester-long group project, 4-5 students
  - They choose, we add/merge groups until there are 4-5 students per group
- In Spring 2023 introduced: Project Initial Plan with brainstorming activity
- Why did I do this? - Model authorized AI use for learning

This is where they can use LLMs

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Brainstorming in Initial Plan

- Goal in Project Initial Plan: Start thinking about your data science project without getting bogged down in details
- Brainstorm + Reflection questions = 40% of grade
- Brainstorm 2 options:
  - LLM
  - Mind map – for those who are opposed to using LLM
- LLM prompt template provided
- Link to actual student web page: https://duke.is/cs216-initial-plan

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Brainstorming with an LLM

Prompt Template

> *Context: We are intro to data science Duke students, and we want you to help us brainstorm for a semester-long data science project. Here is the course website (https://sites.duke.edu/compsci216sp2026/) read through it to understand our context.*
>
> *We are interested in the following topics: TOPIC_1, TOPIC_2, and TOPIC_3. There are COUNT of us in the group, and generally the project should require enough work for that many people, sometimes 1 research question per person, but not necessarily.*
>
> *Ask us questions to help us come up with ideas or give us multiple ideas on what our projects can do, suggest where we could find data sets for that idea, and try to connect our interests together if possible. Start by asking us clarifying questions to help us brainstorm better.*

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Reflection Questions

- Why did you choose the method you used?
- What patterns do you see in what you found interesting?
- What research topics or questions did your group generate from this brainstorming? Which of these ideas can you see your group potentially pursuing?
- Do you feel like more brainstorming is needed before you find a topic?
- If you used
  - The mindmap: Did you find your brainstorming narrowing or diverging as you discuss ideas to write down?
  - LLM: Did it help you find a project your group is interested in? Or did it just generate text that all seems reasonable?

How I Frame the Initial Plan in Class/Lecture

- Goal: Get them thinking early about the project and how they will collaborate
- Motivation:
  - Potentially in portfolio of work for job applications – which requires a good project AND group agreement
  - Set group work expectations and consequences if expectations are violated
- Demo: Mind map
- Demo: Share/Show pre-created ChatGPT log and highlight:
  - Prompt template and what needs to be replaced
  - My iterative responses are LONG
  - Responses are purposely directing the LLM

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Student Reaction

General

- Appreciate a way to use LLMs that is allowed
  - Mid-semester survey: "I … enjoy that most of the assignments allow us to consult … LLMs to model the reality of …"
- Mosted used the LLM and not the mind map
- Many used the template

Reflections

- LLM potential guardrail to not go too broad compared to the mind map
- LLM helped expand our ideas
- Iterative refinement and critical evaluation of the ideas was required to get something useful
- Some critical thinking on how LLMs generated unnecessary text like how to do the project
- Mix of whether think need more brainstorming

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Brainstorming with an LLM at a glance

- Context:
  - Post-CS2 data science elective
  - Brainstorming done during initial planning phase of semester-long group project
- Framing of Initial Plan:
  - Think early
  - Discuss how will collaborate
  - Could this become part of a portfolio of work?
- Brainstorming:
  - LLM or Mind map
  - LLM template provided
  - Required reflection questions
- Student reaction:
  - They liked it
  - Most used LLM + template
  - Evidence of critical thinking

Includes: Actual lecture slides and extra resources

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Slides from Class

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Group Initial Plan, due 2/6

- Group Formation due (1/23, today!)
  - Those without a group or too small of a group will be assigned to form groups of 4-5 after due date
- 0.5% of overall grade
- Why? - Early deliverable to get the group to start thinking
- What is in it?
  - Brainstorm as a mind map or LLM with reflection
  - Collaboration plan

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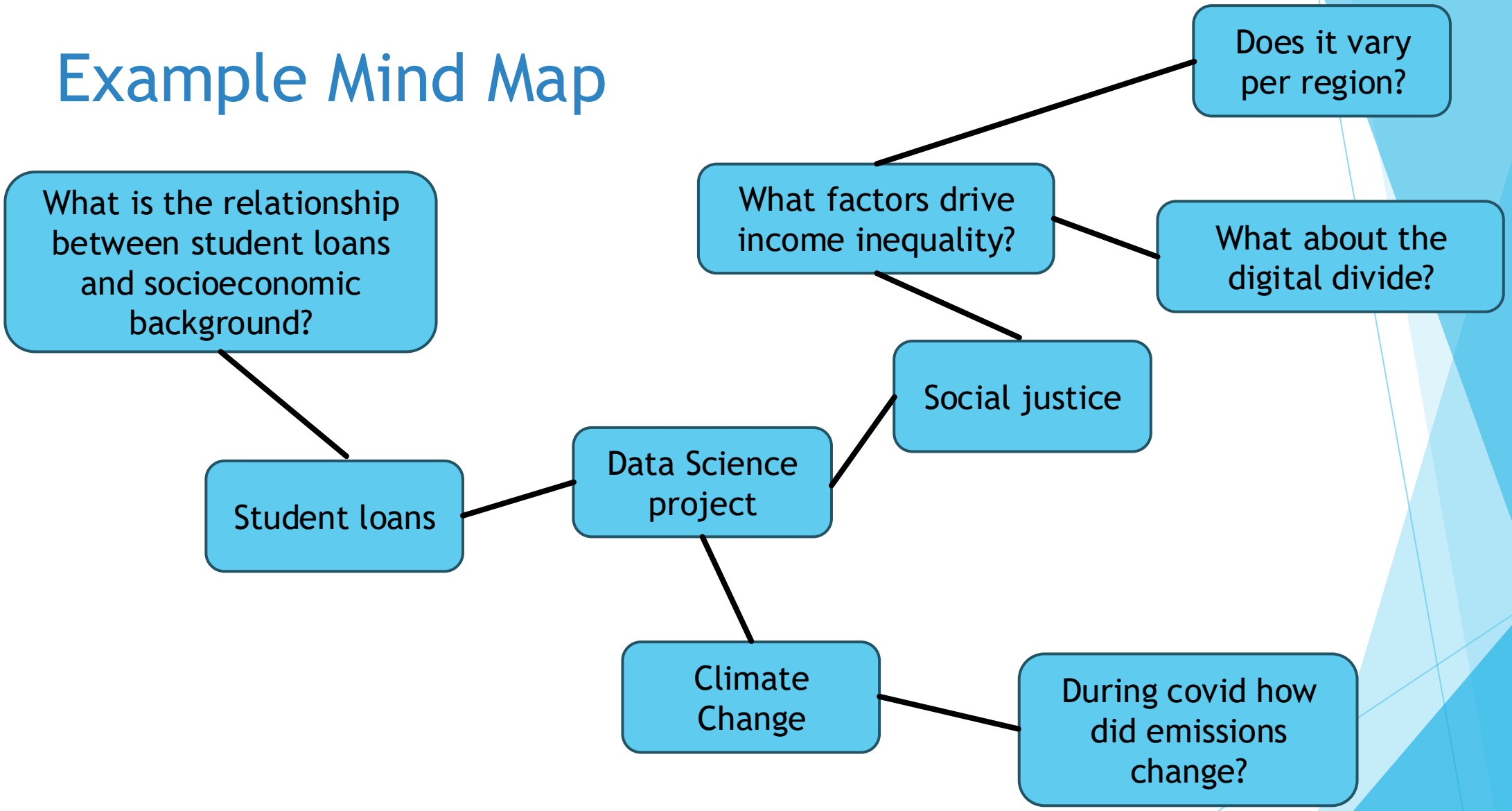
Example Mind Map



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LLM Brainstorm Demo

- https://ai.duke.edu/ai-tools/
- Suggested prompt on Initial Plan web page
- Example using Duke GPT: https://duke.is/cs216-project-chatgpt

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Back up Slides

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Project Initial Plan

- 0.5% of overall grade
- All project milestones combined = 10% of overall grade
- Grade Break Down
  - 35% General directions of correct formatting, page limit, etc.
  - 40% Brainstorm + Reflection
  - 20% Collaboration Plan
  - 5% AI Disclosure

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CS216: Require discloser (and therefore reflection)

- Based on Artificial Intelligence Disclosure (AID) Framework
- Required at end of every homework, take home exam, and project milestone
- Outlined AI Policy section of Policies page
  - This includes new and adapted definitions of the headers from the AID framework

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Resources: My stuff

- Blog post: Generative AI Thoughts, Timestamp Fall 2024
- CompSci/Edu 171CN *Learning how to Learn with AI*
  - The syllabus has a list of the learning objectives, you may find the linked content helpful in thinking through how learning works.
- CompSci216: https://sites.duke.edu/compsci216sp2026/
- Podcast The CS-Ed Podcast has many episodes that are not computer science specific and instead focus on learning and academia in general. Such as:
  - S4xE12: Meet the Professor (Teaching Practice Byte)
  - S4xE10: Scaffolding Project Team Communication, Including for Neurodivergence (Teaching Practice Byte)
  - S4xE8: Multi-Part Question and Answer (Teaching Practice Byte)
  - S4xE6: Peer Instruction (Teaching Practice Byte)
  - S4xE1: Academic Misconduct
  - S3xE2: Alternative grading, how?
- I post useful resources about teaching on my LinkedIn Profile every Monday.
- AI Prompting: Guide to learning effectively with AI – Goal, Prompt, Scrutinize, Follow-up, Verify, Reflect

Resources: Other people's stuff

- Podcast: Designed for Learning
  - Ep. 7 – AI, Cheating, and Trusting Students to be Human
  - Ep. 11 – Bringing the Term Paper into the Classroom
- If you are looking for something that is more media literacy/evaluating AI generated information: https://mikecaulfield.substack.com/
- AI Prompting: CLEAR Framework – Concise, Logical, Explicit, Adaptive, and Reflective
- If You Care About It, Do It in Class by James Lang

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