

Teaching Case:

Making Analytical Reasoning Visible: A CRISP-DM Informed Analytics Assignment with Generative AI

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Hook

How can novice students learn to think like analysts, not just create charts?

Abstract

Introductory information systems courses often teach data analytics through hands-on tool activities, but a novice student can build a chart or a dashboard and still not learn how analysts actually think. The reasoning that matters happens before and around the chart. It is the work of framing a question the data can answer, checking whether the evidence supports a claim, interpreting a pattern with care, and communicating it to someone who was not in the room. Generative AI can hide this reasoning even further, because a polished answer may not show what the student understood or what the AI suggested. This teaching activity responds with a four part analytics assignment for an introductory IS course. Students act as junior analysts advising fast food clients on nutritional value, menu variety, and menu composition, working with a familiar dataset and a data visualization application. They move through a simplified analytics process that includes business and data understanding, visual exploration, evaluation and communication, and a closing reflection on the whole process. The goal is to teach the reasoning each stage requires. At each part, students record their own thinking first, then use AI in one defined role, then explain what changed, what they kept, and why. This before and after structure makes students' decisions, revisions and explanations visible and revisable. It is how students practice judgment they would otherwise skip, and how instructors can review and assess it. Illustrative worksheets and reflections from two course sections show the kinds of decisions the activity surfaced.

Keywords: Analytical Reasoning, Analytics Process, Generative AI, Data Visualization, Information Systems Education.

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1. INTRODUCTION

Employers now expect graduates to work in data rich settings where AI tools are common. The U.S. Bureau of Labor Statistics projects that data scientist employment will grow 34% from 2024 to 2034, much faster than the average for all occupations (U.S. Bureau of Labor Statistics, 2025). Generative AI has become part of everyday business work as well. McKinsey's 2025 global survey reports that 88% of respondents say their organizations regularly use AI in at least one business function (McKinsey & Company, 2025). Introductory IS courses are a good place to begin preparing students for this environment, since many of the students who take them are not analytics majors and are there to gain basic technology and data skills.

In these courses, analytics can easily become a tool exercise, where success comes to mean producing a chart, a dashboard, or a written answer. Tool fluency matters, but does not cover the whole of analytics. Much of the analysts work happens in decisions that a finished chart does not show. An experienced analyst frames a question, judges what the data can support and which variables matter, chooses a visual that fits the claim, reads a pattern, and explains it to an audience. This is the reasoning that separates an analyst from a chart maker. For novice students, this process is mostly invisible. They can hand in a finished visualization, but the reasoning that led to it remains hidden from the instructor.

This is the core teaching problem the activity addresses. Students do not learn stage specific judgment by moving through the stages mechanically. They can complete every part of an assignment and skip the judgment in each one.

AI makes this teaching problem more complicated. It can help students clarify a question, consider alternatives, or test whether their message is clear. But when students use AI without structure, the instructor may see only a polished final answer and not the thinking behind it. Long and Magerko (2020) frame AI literacy as understanding and critically evaluating AI. This activity puts that idea into practice by structuring AI use in ways that keep students' own reasoning visible.

The analytics assignment answers this with a four part activity for novice business students. Students take the role of junior analysts advising fast food clients, working with a familiar dataset and a data visualization application. While in the class described here students used Tableau, any comparable tool would work. Students move through a simplified analytics process, defining a business question, exploring the data, building visual evidence, communicating an insight, and reflecting on responsible AI use. The sequence of the assignment design is important. In each part, students first document their own reasoning, then use AI in one defined role, and then explain what they changed and why.

The primary contribution is a design that teaches the judgment each stage of the analytics process requires. The before and after structure makes that judgment visible in a form students can revise and instructors can review. A secondary contribution is the structured use of AI. Rather than a general answer generator, AI acts as a tutor, a collaborator, an audience proxy, and a reflective partner, with each role tied to a stage of the work. This keeps AI in a supporting position and produces a documented trail of the student's thinking.

Structured AI use in analytics assignments is not new. Published designs have students critique AI generated output, compare their own work against an AI response or use AI as a writing aid once the analysis is complete (Crompton & Burke, 2024; Tzirides et al., 2024). What distinguishes this design is the combination of three features. Students document their own reasoning before any AI use. AI is assigned one specific role per stage rather than a general assistant role. Each part closes with an explanation of what the student changed and what they retained. The pre AI record makes the

comparison possible while the stage specific roles keep AI from substituting for the judgment being taught.

This manuscript presents the assignment as an adoptable teaching activity, with student worksheets and reflections used as illustrative teaching evidence. The purpose is to offer a design that instructors can adopt or adapt to their teaching. The sections that follow review the supporting literature, describe the assignment structure, present evidence of and guidance for implementation.

2. LITERATURE REVIEW

Introductory IS courses increasingly include analytics, visualization, and generative AI. Because many students see these topics for the first time, course instructors need activities that make the material accessible and manageable. Three areas of literature frame this activity. The first examines how novices move beyond tool use toward reasoning. The second focuses on the analytics process and how reasoning an expert analyst practices can be made visible. The third considers how generative AI can be structured so student judgment stays central.

2.1 Moving Novices Beyond Tool Use

A central challenge in introductory analytics is helping students reason with data rather than only operate a tool. The National Academies of Sciences, Engineering, and Medicine (2018) argues that undergraduate data science should build data acumen, so that students work with data, ask questions, analyze patterns, and communicate results. Baumer (2015) makes a similar case, arguing that students need to experience the full process of analysis from question to exploration to communication. This matters in introductory business and IS courses, where many students use a visualization tool for the first time and may mistake a finished chart for a finished analysis. Experiential learning helps address this challenge by giving students opportunities to work through concrete tasks and reflect on what they are doing (Kolb, 2014). The task itself also matters. When the scenario is realistic but manageable, students can see why a question matters and who would use the answer. This reflects situated learning in which students learn analytical tools through meaningful contexts and authentic activities rather than as abstract exercises (Brown, Collins, & Duguid, 1989).

2.2 The Analytics Process and Visible Expert Reasoning

Students also need to understand that analytics is a process. CRISP-DM offers a well established model that describes business understanding, data understanding, data preparation, modeling, evaluation, and deployment (Shearer, 2000). The assignment described here is CRISP-DM informed rather than a full implementation. It adapts business understanding, data understanding evaluation and communication for novice students and does not include data preparation, modeling or deployment. It makes the stages of analytics visible to a novice, showing that analysts clarify a problem, examine data, decide how to represent it, judge whether results are meaningful, and communicate them. Cognitive apprenticeship adds a second lens. Collins, Brown, and Newman (1989) describe how modeling, coaching, and scaffolding can make expert thinking visible to learners. In analytics, expert reasoning is usually hidden. An experienced analyst can quickly sense when a question is too broad or that a visual claims more than the data shows. Instructor modeling can make those hidden judgments visible.

Two related literature areas explain why recording reasoning before AI use should help. Research on self explanation finds that learners who articulate their reasoning while working understand material more deeply than those who do not (Chi et al., 1994). Research on metacognition similarly emphasizes the importance of learners monitoring and evaluating their own thinking and developing awareness of their learning processes (Schraw, 1998). The before and after structure draws on both ideas by making the student's initial reasoning explicit and using that written record as the reference point against which AI feedback is evaluated.

2.3 Generative AI, Communication, and Responsible Use

Data visualization is a natural entry point for novices because it lets them explore patterns and communicate findings. Visualization is an analytical act, not only a technical one. Few (2012) and Knafllic (2015) emphasize audience, context, and message rather than simply producing a chart. AI can support

this work through explanations, examples, and fast feedback (Crompton & Burke, 2024; Qian, 2025). Recent work on generative AI as a source of formative feedback finds benefits when the feedback prompts revision rather than supplying an answer (Dai et al., 2023), but the benefit depends on students remaining active in questioning the output (Yang et al., 2024). Students must interpret suggestions, recognize AI's limits, and judge whether its output fits the data and task (Tzirides et al., 2024; Zhan et al., 2025). The assignment addresses this challenge through before and after checkpoints that keep student reasoning visible when AI is used.

3. THE ASSIGNMENT AND THE REASONING BEHIND EACH STAGE

The assignment asks students to submit not only the finished visualization but the decisions that led to it. Students take the role of junior analysts advising fast food clients and work through four parts, each corresponding to one stage of the analytics process. The full dataset and business scenario are described later in this section, and Table 1 lays out the four parts together.

Figure 1 shows how the assignment is organized. Reading left to right, the four parts are the analytics process itself, moving from business and data understanding to visual exploration, then to evaluation and communication, and finally to reflection. Reading top to bottom within any one part, a short reasoning loop repeats. The instructor first models the judgment that part requires. Students then work through an initial reasoning step on their own, use AI in one defined role, and decide what to revise and what to keep, describing the decision. Each pass leaves behind artifacts including the initial question, the exploratory visual, the AI prompt and a short response excerpt, the revised work, the explanation of changes, and the reflection. Across the four parts these form a documented trail that runs the length of the project.

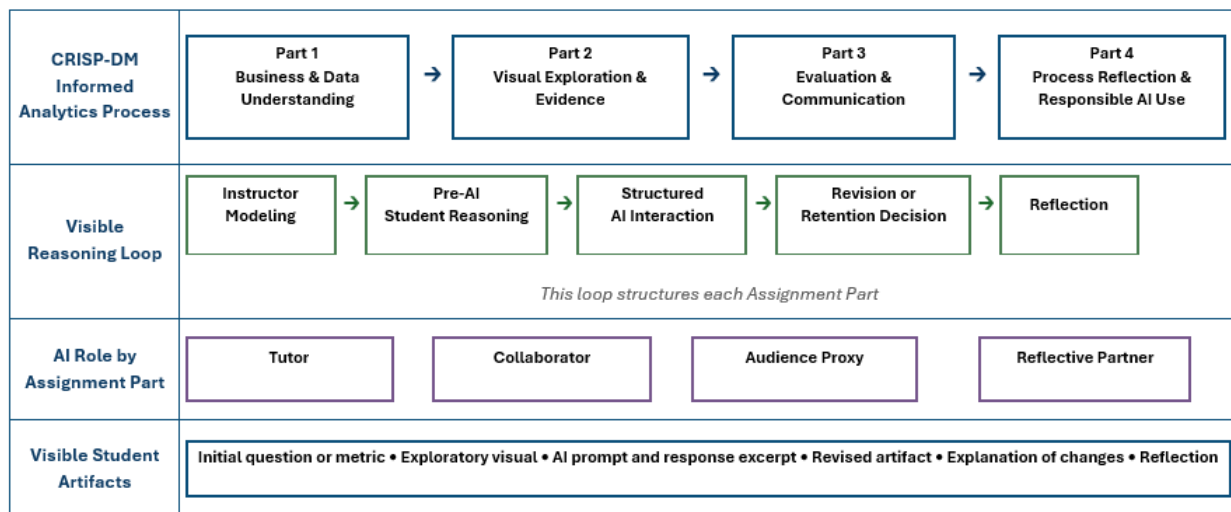


Figure 1. Design Architecture for Making Analytical Reasoning Visible

Novices take predictable shortcuts at each stage and the instructor's role is to model the judgment that moves past them. The four parts below describe that judgment. Each part needs only a few minutes of modeling (i.e., usually a single example shown to the whole class before students begin).

3.1 Part 1: Framing a Question the Data Can Answer

Most novices begin with a broad interest in the data. They ask which restaurant is healthiest, or which menu is best. These are not yet analytical questions, as they carry no clear measure and limited ties to the available fields. For example, the word healthiest could mean many things, and the data does not settle which. The reasoning this part teaches is about scope and fit. It requires separating two things novices tend to merge which are the business question, which states what someone wants to know, and the analytical metric, which states what will be computed from which fields to answer it. For example, a broad interest in healthy fast food could narrow into which company has the highest average sodium per 100 grams. The business question concerns nutritional profile where the metric is mean sodium

normalized by serving size. It is computed from the sodium and serving size fields. Normalizing is important as a large shared platter and a single sandwich are both one record. The instructor models this narrowing out loud, walking through two or three candidate measures and pointing to the fields that make each one answerable. Consequently, students learn the lesson that a good question is chosen, not assumed. AI then enters as a Tutor, helping students refine their own question or metric.

3.2 Part 2: Choosing Visual Evidence That Supports the Question

With a question in hand, students turn to the visuals. A common student shortcut is to build charts that display data rather than answer the question. A student may add every field or crowd the view with dozens of products, treating the chart as a place to show the data rather than to make a point. The reasoning this part teaches is evidence selection. An analyst asks what a reader would need to see to understand the point and then builds only that. If not, a chart of every product can bury the finding that a chart of the top ten would make obvious. To model this, the instructor puts two versions of the same chart side by side, one cluttered and one focused, and asks the class which better supports the claim. Students usually see the point quickly that more data on the screen does not mean a clearer message. They then build visual evidence for a refined question and use AI as a Collaborator for feedback on clarity, chart choice, layout, and labels. They may revise at least one element and explain why the change strengthened the analysis.

3.3 Part 3: Evaluating and Communicating an Insight

This part involves two distinct steps. Step one, evaluation, involves checking whether the claim survives contact with the evidence. Step two, communication, entails turning a checked claim into a message a client can use. Novices tend to rush the first to get to the second. They may move straight from a chart to a story by reading a pattern off a visual, deciding it is the finding. They may begin writing without checking whether the visual supports the claim or whether the dataset can justify it. The reasoning this part teaches puts a stop between the chart and the story. Before communicating, an analyst evaluates, asking whether the pattern is read correctly, which specific visual backs the claim, and whether the data can support the conclusion at all. Once the claim is checked, the analyst can turn it into a short message for a non-technical reader by explaining not just what the chart shows, but why the pattern matters. The instructor models both parts of the work. First, the instructor tests a draft claim against the visual. Then, the instructor rewrites a plain description as an insight a client could act on. For example, the claim "this chart shows sugar by company" becomes "this pattern points to which companies may need clearer nutrition messaging." Students then identify two or three key insights and check each against their visuals, naming the specific chart and the specific value that supports it, before drafting a short data story in their own words. AI acts as an Audience Proxy, testing whether the message is clear and whether the evidence behind it is convincing. Then students revise the story and describe what changed.

3.4 Part 4: Reflecting on the Whole Process

The final part closes the loop. Because students have worked through the project one part at a time, the work can feel like four separate tasks rather than one connected process. Part 4 asks students to step back from the finished product and look across the full process. The reasoning here is process level reflection. Students trace how their thinking changed from the first question to the final message. They locate where the business question shifted, where a visual was rebuilt, where an interpretation was corrected, and where the communication was sharpened. They also reflect on where AI helped, where it pulled them off course, and where their own judgment mattered most.

Responsible AI use is part of this reflection. An AI suggestion can sound authoritative and still not fit the data, the question, or the audience, and the analyst has to make that call. Part 4 makes it explicit. Students reflect on how they used AI across the project and evaluate short scenarios that raise transparency, privacy, interpretation, and ownership of the final decision. The instructor models the reflection by naming one moment when their own thinking changed, one AI suggestion worth taking, and one worth turning down. The aim is for students to see the project as a single line of work they carried and owned, rather than a set of tasks the tools completed for them.

3.5 Dataset and Business Context

Students take the role of junior analysts at InsightBridge Analytics, a consulting team advising fast food clients who want to understand nutritional value, menu variety, and menu composition. The scenario developed is deliberate. Students know fast food as consumers, but here they have to examine it analytically and develop questions that lead to data driven answers rather than rely on impressions. The base dataset was compiled from publicly available fast food nutrition datasets on Kaggle and adapted for instructional use. Nutrition values reflect nutritional information published by the chains themselves. It covers 471 menu items from six chains with measures such as energy, carbohydrates, protein, fiber, sugar, total and saturated fat, trans fat, cholesterol, and sodium, along with company, product, category, and serving size. Four fields were added as simulated instructional data. These included year, season, and indicators for new and discontinued items. Season identifies whether an item is offered for a limited time or throughout the year. The indicators identify the product's first and last year in the file. Appendix A provides a data dictionary explaining how each field was constructed and notes the limitations of the data. As the data covers nutrition and menu information only, students are guided to define value in ways the data can support. This teaches an early lesson that a business question must align with the available data. Students cannot make claims about sales, pricing, or demand, because those fields are not there.

Each part follows a similar worksheet structure. Students complete their own work before using AI, interact with AI for a defined purpose, explain what they revised or retained, and reflect on what changed. Each part also includes a simple rubric. Table 1 summarizes the four parts and the AI role in each. The full student packet, with assignment descriptions, worksheets, and rubrics, appears in Appendix A, and instructor facing support resources appear in Appendix B. Appendix B specifies what AI may do in each role and what remains the student's responsibility, so that instructors can state the boundary to students and assess against it.

The assignment directed students to document their work through screenshots and written description. It did not require or prohibit uploading the dataset to an AI tool. As the dataset contains only publicly published nutritional information, uploading it raises no privacy concern. Instructors adapting this activity to sensitive or proprietary data should set an explicit policy and state it in the assignment.

Part	Analytics Process Focus	Main Student Task	AI Role	Deliverable
Part 1	Business and data understanding	Define and refine a business question that can be answered with the available data.	Tutor	Worksheet and visualization file
Part 2	Visual exploration	Create and revise visual evidence	Collaborator	Worksheet and visualization file
Part 3	Evaluation and communication	Check insights against the evidence, then write a short data story	Audience Proxy	Worksheet with revised story
Part 4	Process reflection	Reflect across the whole process and on responsible AI use	Reflective Partner	Reflection worksheet

Table 1. Fast Food Analytics Assignment Overview

In every part, AI responds to work the student has already produced. It is not used to generate a first question, a first chart, or a first interpretation.

4. ILLUSTRATIVE EXAMPLES OF STUDENT REASONING

The assignment was implemented in two sections of an introductory IS course in Spring 2026 with 23 and 24 students enrolled. The examples below are drawn from student worksheets and reflections produced as normal coursework in the instructor's own sections, anonymized before analysis. Excerpts were selected by the instructor to illustrate the range of decisions the artifacts made visible, and are presented as illustrative rather than as systematic evidence of learning gains. Quotations are

anonymized and reproduced as written, with minor spelling and punctuation corrections. They come from different students across the two sections. Because each part pairs a rubric with an artifact, a simple visual can still earn a strong score when the student explains why the question matters and what changed. A polished visual can reveal weak reasoning when the student cannot explain the evidence.

One form of reasoning was the move from a broad interest to a focused question that the dataset could answer. Some students began with topics like healthy fast food or which restaurant is better. Part 1 made the refinement visible by asking for an initial question, an exploratory visual, and then a revision after AI feedback. One student put it plainly, "I realized it was not really fair to compare the items just by serving size because some portions were bigger. Changing it to per 100g made the comparison make more sense." The comment shows attention to comparability, and to whether the claim was fair.

A second type appeared in revisions to visual evidence in Part 2. One student wrote, "At first I had way too many products on the chart. I changed it to the top 10 because it was easier to read and made the main point clearer." The revision was simple, but the reasoning was important. The student recognized that more data on the screen does not necessarily lead to clearer communication.

Part 3 made another type of reasoning visible. Before communicating an insight, students had to check whether their claims were supported by the visuals and the dataset. One student caught a claim that had run ahead of the evidence. "AI made me realize that I was saying more than my dashboard actually showed. I changed the wording so it matched the chart better." The key outcome was not that AI identified the gap. It was that the student verified the claim against the evidence before including it in the story. Another student recognized the boundary of the dataset. "Some of the AI suggestions sounded good, but it kept asking for things that were not in the data, like what people would pay or how many customers there were. I could not use that because it was not in my spreadsheet." The suggestion sounded useful, but the student judged it against the available evidence and set it aside. Upon completing this type of checking, students turned to communication. One quote described the shift from the students own understanding to the reader's as follows "It made sense to me because I made the dashboard, but I realized someone else looking at it might not know what I was trying to show."

The final type of reasoning involved looking back across the whole process. Students moved beyond a single visual or written story and considered how their thinking changed across the project. This helped some students recognize their own reliance on AI. One student wrote, "I think I leaned on AI too much for ideas at one point. It helped, but I can see how it would be easy to let it do too much of the thinking." Another student described the balance the activity tried to encourage, "I think AI works better after you already tried something yourself. It should help you improve your work, not just make the whole thing for you." In addition to these comments being ones about responsible AI use, they are also judgments about the student's own reasoning process from framing the question, choosing evidence, checking a claim, and communicating it. Read this way, the Part 4 reflections give instructors something to respond to when students treat the four parts as one connected line of analytical work.

Taken together, the artifacts show what the structure made available for review. In these examples students framed questions, built and revised evidence, checked their claims, communicated insights, and weighed AI feedback. They did so in a documented form an instructor could examine. The same artifacts also showed where students needed support. Questions sometimes stayed too broad, some visuals did not clearly support a claim, and some prompts were generic, while a few students over trusted AI. These can be useful signals. They show where modeling and feedback can be strengthened in a future implementation. Future research could systematically analyze all student reflections using a defined coding scheme.

5. TEACHING NOTES AND IMPLEMENTATION GUIDANCE

This activity is designed for introductory IS or business analytics courses where students have had basic exposure to a data visualization tool and generative AI. Appendix B provides additional instructor-facing supports, including a suggested timeline, modeling guidance, a prerequisites checklist, the AI role boundaries, common student challenges, and adaptation options.

5.1 Course Fit and Instructor Preparation

The activity works best after students have learned how to open a dataset, create simple charts, and use a generative AI tool at least once. Students should have some prior experience creating charts so they can focus on analytical reasoning rather than learning the mechanics of the tool.

Before launching the activity, instructors should prepare the dataset, worksheets, rubrics, and AI-use guidelines. Students should also be reminded to make claims only from variables in the dataset. Visualization expectations should match student preparation. Where visualization experience is limited, a few basic visuals and screenshots are sufficient. Where preparation is stronger, instructors may require a dashboard, filters, calculated fields, or more detailed design expectations. Technical requirements should support the reasoning goals, not overwhelm them.

The full activity fits a two to four week window, depending on course length and how much class time is available for feedback. A shorter version can reduce the number of visuals or combine communication and reflection. A longer version can assign one part per week and add brief feedback between parts, especially after Part 1 as the question being explored shapes the rest of the activity.

5.2 Modeling and Feedback

Instructor modeling is central to this activity. Novice students often need to see what analytical reasoning looks like before they can practice it. A short example at the start of each part is usually enough. Section 3 describes the specific steps for each part. The common thread is that the instructor performs the judgment out loud before students attempt it.

Instructor feedback should reward reasoning over polish. Part 1 requires the most attention because the question shapes everything that follows. Early feedback should push students to connect their question to specific dataset fields and to identify the evidence available to support their analysis. Even with a simple chart, students who can make that connection are beginning to reason like analysts.

5.3 Managing AI Use

Students should be provided with clear guidance before they start. In this class, students were free to choose any AI tool, which mirrors how they will meet AI at work and keeps the focus on how they use it rather than on a single product. AI may clarify a question, suggest comparisons, give feedback on a design, test a data story, or support reflection. However, it should not replace interpretation, invent unsupported conclusions, or write the submission. Documentation of AI use can be light. Students submit the prompt, a short response excerpt, and a brief note on what they did with the feedback. Appendix B contrasts generic and specific prompts for each part.

5.4 Recommendations for Adoption

Two practical lessons stood out across the two sections. The before and after worksheets did make reasoning visible, but they also increased grading load, because each part produces several artifacts rather than one product. Instructors with limited time can grade one or two evidence sources per part. The revision explanation and the reflection are good choices to grade since they carry the most reasoning. A second lesson concerned AI. Some students over trusted it and revised simply because the AI proposed a change. These students may need reminders that they still own the final judgment. One way to reinforce this is to ask students, in the Part 2 and Part 3 worksheets, to justify why an AI suggestion fits the data and the audience before they act on it. Common student challenges, from broad questions to cluttered visuals to generic prompts, appear with teaching responses in Appendix B.

Part 3 requires careful attention because the key reasoning occurs before writing. Section 3.3 outlines the evidence check instructors should model in class. Students who test their claims first tend to write more accurate stories.

The final part also needs careful framing. It should help students synthesize the whole process, not simply write a closing paragraph about AI. The most common weak response is a general statement such as "AI helped me." One way to push past this, without lengthening the assignment, is to hold a

short class discussion after the project. Students can name specific decisions from earlier parts, including which question changed, which visual they rebuilt, and where they accepted or turned down AI's advice. By focusing on specific decisions, the discussion brings out process-level reasoning that a general written response may leave hidden.

6. CONCLUSION

Novice students in introductory IS courses need more than practice in tool features. Students need to develop the judgment required at each stage of the analytics process while learning to use AI without allowing it to make those decisions for them. The assignment described here gives instructors a practical way to teach it. The judgment each part requires is named, modeled, and then practiced, and the before and after worksheets record the decisions students made and the changes they chose. Instructors can give feedback on reasoning rather than only on a finished chart, and students can compare their initial reasoning with their revised work. Because each AI role is tied to a part of the process, AI use becomes something students document and defend rather than something that quietly replaces their judgment. The activity does not depend on the fast food dataset or on any single tool. Instructors can use the same structure with other datasets and visualization applications, as long as students can ask a real question, build evidence, and communicate an insight. The design aim is to help students slow down, record their decisions, weigh feedback, and own the final analytical judgment.

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Appendix A

Student Assignment Packet: Fast Food Analytics Project

This appendix provides the complete student facing materials for the four part Fast Food Analytics Project. The packet includes assignment descriptions, student worksheets, and grading rubrics. Formatting has been condensed for manuscript submission. Instructors may adapt the point values, tool requirements, and AI use expectations to fit their own course context.

PROJECT OVERVIEW FOR STUDENTS

In this four part project, you will act as an analyst for InsightBridge Analytics, a consulting team advising fast food clients on nutritional value, menu variety, and menu composition. You will use a fast food nutrition dataset and a data visualization tool to develop a business question, create visual evidence, evaluate and communicate findings, and reflect on the whole process including responsible AI use.

Project goal:

- Define a business question that can be answered with the dataset.
- Explore the data visually and identify patterns that matter to a business audience.
- Check your insights against the evidence before you communicate them.
- Use AI in defined support roles while keeping responsibility for your own analytical decisions.
- Explain what changed, what you retained, and why.

Dataset: fast_food_nutrition_2022_2025_clean.csv. Each record represents one menu item offered by one company in one year. The file contains 1,581 records covering 471 menu items from six chains.

Field	Description
company	Restaurant chain. Burger King, Domino's, KFC, McDonald's, Pizza Hut, or Starbucks
product	Menu item name
category	Menu section. Not comparable across companies — see limitations
per_serve_size	Serving size as originally published
serve_size_value	Numeric serving size
serve_size_unit	g or ml
energy_(kcal)	Energy per serving
carbohydrates_(g), protein_(g), fiber_(g), sugar_(g)	Per serving. Sugar is a subset of carbohydrates
total_fat_(g), saturated_fat_(g), trans_fat_(g)	Per serving. Saturated fat is a subset of total fat
cholesterol_(mg), sodium_(mg)	Per serving
year	2022, 2023, 2024, or 2025
season	Year-round, or Fall, Winter, Spring, Summer for limited time offerings
new_item	TRUE in a product's first year, if after 2022
discontinued	TRUE in a product's final year, if before 2025

Note the limitations about the dataset:

- Domino's has no sodium values. Any sodium comparison must exclude Domino's and say so.
- Menu categories are not comparable across companies. Each chain uses its own naming.
- Serving sizes are not equivalent. A 15 piece platter and a single scone are both one record.
- Some values are missing where the published figure was internally inconsistent. They were not estimated.
- There are no sales, price, or customer fields. Questions about popularity or profitability cannot be answered here.

AI use note: You may use a generative AI tool only in the assigned role for each part. You must document the prompt you used, include a short excerpt from the AI response, and explain how you used, revised, or rejected the suggestion. AI may support your thinking, but it may not replace your own analysis or final judgment.

Part	Analytics process focus	AI role	Main student task	Deliverable
Part 1	Business and data understanding	Tutor	Define and refine a business question that can be answered with the available data	Worksheet and visualization file
Part 2	Visual exploration and evidence	Collaborator	Create and revise visual evidence	Worksheet and visualization file
Part 3	Evaluation and communication	Audience Proxy	Check insights against the evidence and write a short data story	Worksheet with revised story
Part 4	Process reflection and responsible AI use	Reflective Partner	Reflect across the whole process and responsible AI use	Reflection worksheet

PART 1: UNDERSTANDING THE BUSINESS AND THE DATA

Focus: Frame the business problem, explore the dataset, and use AI as a Tutor to refine the analytical focus.

Scenario: You have just joined InsightBridge Analytics, a consulting team hired by fast food clients that want to better understand nutritional value, menu variety, and menu composition. Before analysis begins, your team must define a useful business question and understand what the data can support.

Deliverables: completed Part 1 worksheet and visualization file (e.g., twbx Tableau file).

Rubric

Criteria	Points
Clear business question and rationale	2
Question is answerable with the available fields	2
Initial visual exploration and evidence	2
AI Tutor interaction documented	2
Revision/reflection explains how AI shaped thinking	2
Total	10

STUDENT WORKSHEET: PART 1

Section 1A - Pre-AI Exploration. Complete this section before using AI.

- Define your initial business question. What would interest a restaurant manager or customer? Examples: healthiness, menu diversity, nutrient balance.

Why is this question useful? (2-3 sentences)

- Explore the data in Tableau. Create one exploratory visualization that helps begin answering your question. Paste a screenshot of your chart below.

Briefly describe what you notice. (2-3 sentences)

Section 1B - Post-AI Refinement. Complete this section after finishing Section 1A.

- Interact with AI in the Tutor role. Use AI to help refine your question or metric. Your prompt(s):

Key AI response excerpt (2-3 lines):

- Revise your question or metric. Revised question/metric:

Explain what changed and why. (2-3 sentences)

Section 1C - Reflection

- Short reflection: What was most helpful about AI tutoring? When did you choose not to use AI suggestions, and why? How did your understanding of the data or problem improve?

PART 2: VISUAL EXPLORATION AND EVIDENCE

Focus: Create and refine simple visualizations that help answer the refined question from Part 1.

Scenario: Your client was interested in your initial findings and now wants clearer visual evidence. Your task is to build accurate, readable, and meaningful visuals that support your question, first on your own and then with AI feedback. Depending on your instructor's requirements, you may present these as individual visuals or combine them into a simple dashboard.

Deliverables: completed Part 2 worksheet and visualization file (e.g., twbx Tableau file)

Rubric

Criteria	Points
Visuals/dashboard connect to the refined question	3
Visuals are clear, readable, and appropriate	2
Interpretation identifies meaningful patterns	2
AI Collaborator interaction documented	1.5
Revision/reflection explains what changed and why	1.5
Total	10

STUDENT WORKSHEET: PART 2

Section 2A - Pre-AI Visual Exploration. Complete this section before using AI.

- Design your visuals. Build 3-4 clear visualizations in Tableau that help answer your refined question from Part 1. Think about which chart types best represent your data and how each visual contributes to your story. Give each visual a clear title and labeled axes, and include units where the measure is not obvious. If you use color to distinguish groups, use Tableau's colorblind palette. Combine the visuals into a simple dashboard if assigned by your instructor. Paste a screenshot below.

Describe your visuals/dashboard. What is it showing? What key insights do you notice? (2-3 sentences)

Section 2B - Post-AI Collaboration. Complete this section after finishing Section 2A.

- Interact with AI in the Collaborator role. Ask AI for feedback on visual clarity, chart choice, layout, titles, labels, or visual emphasis. Your prompt(s):

Key AI response excerpt (2-3 lines):

- Refine your visuals/dashboard. After reviewing AI feedback, make at least one improvement. Paste a screenshot of your revised visual or dashboard below.

Explain what you changed and why. (2-3 sentences)

Section 2C - Reflection

- Short reflection: How did AI contribute to your decision making in building or revising the visuals? Which suggestions were helpful or unhelpful? How did this collaboration change how you think about visual design or storytelling?

PART 3: EVALUATION AND COMMUNICATION

Focus: Evaluate whether your insights are accurate and supported by the evidence, then communicate them clearly to a non-technical audience.

Scenario: Your client appreciated the visual work from Part 2, but now wants a concise explanation of what the visuals mean. Your task is to interpret the results, craft a short data story, and use AI as a practice audience to test whether the message is clear and convincing.

Deliverable: completed Part 3 worksheet.

Rubric

Criteria	Points
Key insights are accurate and supported by visuals	3
Data story is clear for a non-technical audience	3
AI Audience Proxy feedback documented	2
Revision/reflection explains how communication improved	2
Total	10

STUDENT WORKSHEET: PART 3

Section 3A - Evaluate the Evidence. Complete this section before drafting your story.

- Identify your key insights. Review your dashboard or visuals from Part 2. List two or three major takeaways or patterns that a restaurant manager or customer might find useful. For each insight, name the specific chart it comes from and the specific value or comparison that supports it.

Insight 1:

Chart this comes from: _____ Value or comparison that supports it: _____

Insight 2:

Chart this comes from: _____ Value or comparison that supports it: _____

Optional Insight 3:

Chart this comes from: _____ Value or comparison that supports it: _____

- Draft your data story. Write a short 3-5 sentence narrative for a non-technical audience. Communicate only insights you have checked against the evidence. Focus on clarity and relevance rather than chart details.

Paste or insert your final dashboard/visual reference below.

Section 3B - Post-AI Evaluation. Complete this section after finishing Section 3A.

- Interact with AI in the Audience Proxy role. Ask AI to review your story or a description of your visuals. You might ask: What seems clear or confusing? What key message stands out? What evidence could make it more convincing? Your prompt(s):

Key AI response excerpt (2-3 lines):

- Refine your story or dashboard explanation. Based on AI feedback, make one or more revisions to improve communication.

Explain what you changed and why. (2-3 sentences)

Section 3C - Reflection

- Short reflection: How did checking your insights against the evidence change your story? How did AI help you see your story from an audience perspective? Which suggestions were helpful or not helpful?

PART 4: REFLECTION AND RESPONSIBLE AI USE

Focus: Reflect on the full analytics process, tracing how your thinking developed across the project, and consider what responsible AI use means as part of that judgment.

Scenario: You are concluding your work with InsightBridge Analytics. In a professional analytics project, the final stage often involves stepping back to review the whole process and deciding how insights should be used. In this class project, your final task is to look across all four parts, reflect on how your thinking developed, and consider how AI shaped your work.

Deliverable: completed Part 4 reflection worksheet.

Rubric

Criteria	Points
Reflection explains how AI shaped learning and decision making	3
Responsible/risky AI scenarios are evaluated thoughtfully	3
Final reflection shows insight about responsible AI use	2
Final reflection is complete, specific, and thoughtful	2
Total	10

STUDENT WORKSHEET: PART 4

Section 4A - Reflection on AI Use and Learning.

- How AI shaped your learning. Respond in one paragraph: When did AI most effectively support your work? When did you choose to trust your own judgment instead? How did this balance influence your learning or creativity?

- AI as Reflective Partner. Use AI one final time, not for analysis, but for reflection. Example prompt: "I used AI as a tutor, collaborator, and audience proxy across a data project. What might this reveal about my learning process or growth as an analyst?" Your prompt(s):

Key AI response excerpt (2-3 lines):

Your takeaway: What insight or realization about your learning stood out after this conversation with AI? (2-3 sentences)

Section 4B - Responsible AI Use.

- Responsible or risky? For each example, decide whether it represents responsible or risky AI use and explain why in one sentence.

Scenario	Responsible or risky? Why?
A student uses AI to help summarize their own findings, then reviews, edits, and verifies the wording before submitting.	
A student copies an entire AI generated dashboard description and submits it as their own.	
A student asks AI to compute an average across categories, does not understand how the figure was produced, and includes it in the data story.	
A student uploads confidential company data to a public AI website.	

Section 4C - Final Reflection

- Final reflection: Looking across the whole project, what does responsible AI use mean to you now? How might you apply what you learned about the analytics process and about working with AI in future coursework or your career?

Appendix B

Instructor Implementation Supports

These materials are intended to help instructors plan the assignment, model analytical thinking, set boundaries on AI use in each part, assess reasoning visibility, respond to common student challenges, guide structured prompting, adapt the activity to different course contexts, and confirm that students have the prerequisite skills. The student facing assignment packet appears in Appendix A.

1. Suggested Timeline and Instructor Modeling Supports

The assignment can be implemented over two to four weeks depending on course length, student preparation, and available class time. A longer implementation allows more time for feedback between parts. A shorter implementation can work if the visualization requirements are reduced and students complete some work outside class. Table B1 provides one possible implementation schedule for a two week version of the assignment.

Week or Class Period	Assignment Focus	Instructor Modeling / Support	Student Outcome
Week 1 / Session 1	Introduce the scenario and dataset; begin Part 1	Model narrowing a broad topic into a question the dataset can answer.	Initial and revised business question
Week 1 / Session 2	Begin Part 2 visual exploration	Demonstrate how visuals should support the question rather than simply display fields.	Initial visual evidence
Week 2 / Session 3	Revise visuals; evaluate and prepare to communicate; begin Part 3	Model how to check a claim against visual evidence before writing the story.	Revised visual artifact and checked insights
Week 2 / Session 4	Complete Part 3 and Part 4	Guide students in reflecting on how their reasoning and AI use changed across the project.	Data story and process reflection

Table B1. Suggested Timeline and Instructor Modeling Supports

Instructors using a longer timeline may assign one part per week. This allows time for brief feedback after Part 1 before students begin creating visuals in Part 2. Instructors using a shorter timeline may combine Parts 3 and 4 or reduce the number of required visuals.

2. Instructor Modeling Guide

Instructor modeling is a central part of the assignment because novice students often do not yet know what analytical reasoning looks like. Modeling does not require lengthy lectures. Short examples, guided questions, or brief demonstrations can help students see how an experienced analyst approaches each part of the analytics process. Much of the evaluation and process tracing described below happens as in-class modeling and discussion rather than as separate written worksheet steps. Table B2 provides examples of modeling moves that instructors can use before each assignment part.

Assignment Part	What Students Are Learning	Instructor Modeling Example
Part 1: Business and data understanding	How to frame a useful business question the dataset can answer	Show how "Which restaurant is healthiest?" can be narrowed to "Which company has the highest average sodium per 100 grams?" or "How do limited time offerings compare to year round items on sugar?"
Part 2: Visual exploration	How to create visual evidence that supports a question	Compare two chart options and ask students which one better supports the business question. Emphasize that visuals should provide evidence, not simply display data.
Part 3: Evaluation and communication	How to check an insight against the evidence, and then move from description to insight	Model the evaluation step first, taking a draft claim and testing it against the visual by asking which chart supports it, whether the pattern was read correctly, and whether the dataset can justify it. Then model the communication step, showing the difference between "This chart shows sugar by company" and "This pattern

Assignment Part	What Students Are Learning	Instructor Modeling Example
		matters because it helps the client identify which companies may need clearer nutrition messaging.”
Part 4: Process reflection	How to reflect on analytical judgment and responsible AI use	After the project, lead a short discussion that asks students to name specific decisions from earlier parts, such as which question they started with and how it changed, which visual they rebuilt, where they caught a claim the data could not support, and where they accepted or rejected AI feedback.

Table B2. Instructor Modeling by Assignment Part

These modeling moments help students see that analytics involves choices at each part. They also prepare students to document their own reasoning in the worksheets.

3. Boundaries of Each AI Role

AI serves one clearly defined role in each part, while students remain responsible for the analytical decisions. Table B3 identifies what AI may contribute and what students must do themselves, giving instructors clear expectations for both instruction and assessment.

Part	AI Role	AI may	The student must
Part 1	Tutor	Suggest alternative phrasings, point out vagueness, name candidate metrics	Choose the final question and metric, and confirm the fields exist
Part 2	Collaborator	Comment on clarity, chart type, layout, and labeling	Decide which revisions to accept, and build the chart
Part 3	Audience Proxy	React as a nontechnical reader, identify unclear or unsupported statements	Verify each claim against the visual and the data, and write the story
Part 4	Reflective Partner	Prompt reflection with questions	Make and own all judgments about the work

Table B3. Boundaries of Each AI Role

4. Evidence Sources for Assessing Reasoning Visibility

The assignment is designed so that instructors can assess more than the final visual product. Student reasoning becomes visible through the artifacts collected across the assignment. This includes initial questions, visuals, AI prompts, revised work, explanations of changes, and reflections. Table B3 summarizes the evidence sources Instructors can use to assess reasoning visibility.

Evidence Source	What It May Indicate About Student Reasoning	Example Assessment Focus
Initial business question and rationale	How the student first frames the problem and connects it to available data	Is the question clear, relevant, and answerable with the available data?
Exploratory visual	How the student begins translating a question into visual evidence	Does the visual connect to the question and reveal an interpretable pattern?
AI prompt and response excerpt	How the student seeks feedback or clarification at a specific part	Is the prompt purposeful and connected to the analytics task?
Revised question, visual artifact, or story	How the student acts on feedback and improves or redirects the work	Does the revision strengthen clarity, evidence, or alignment with the question?
Explanation of changes	How the student justifies accepting, adapting, or rejecting feedback	Does the explanation show judgment rather than automatic acceptance?
Data story	How the student communicates evidence to a non-technical audience	Is the insight clear, supported by the visuals, and audience appropriate?
Final reflection	How the student understands the analytics process and AI’s role in it	Does the reflection identify specific learning, judgment, and responsible use issues?

Table B4. Evidence Sources for Reasoning Visibility

These evidence sources may be used for grading, feedback, or class discussion. For grading efficiency, instructors may choose to focus on one or two evidence sources per assignment part rather than scoring every artifact in detail.

5. Common Student Challenges and Teaching Responses

The assignment reveals some challenges for novice students. These challenges are useful because they show where students may need additional modeling, examples, or feedback. Table B4 summarizes common student difficulties and possible instructor responses.

Student Challenge	What It Looks Like	Teaching Response
Question is too broad	"Which restaurant is healthiest?" or "Which company is best?"	Ask students to define the measure and connect it to available fields. For example: "What does healthiest mean in this dataset?"
Question is not supported by the dataset	Student wants to analyze customer demand, price, sales, or market share when those fields are not available	Ask, "What evidence do you actually have in this dataset?" Guide students to reframe the question around available fields.
Student jumps to the tool too quickly	Student starts creating charts before defining the question	Ask the student to state the business question before discussing chart type.
Visuals display data but do not answer the question	Visual display includes unrelated charts or repeated views	Ask students to explain what each visual contributes to the question. Remove visuals that do not support the analysis.
Student does not notice a data quality problem	Student reports an average sodium figure for all six chains without noticing that one chain has no sodium values	Ask which records were actually included in the calculation, and what the missing values do to the comparison
Student aggregates across incomparable groups	Student compares average sugar by menu category across companies, where each chain names its categories differently	Ask whether the groups being compared mean the same thing at each company, and what a fair comparison would require
Visual display is cluttered	Too many products, categories, labels, or measures appear at once	Encourage students to narrow the focus and prioritize the main comparison.
Interpretation is only descriptive	Student writes, "This chart shows sugar by company"	Ask, "What does the pattern suggest, and why would the audience care?"
Story includes a claim the evidence does not support	Student writes a takeaway that no visual backs, or that the dataset cannot justify	Ask which visual supports the claim and which field provides the evidence. If neither exists, ask the student to revise or drop the claim.
AI prompt is too generic	Student asks, "How can I make this better?"	Model prompts that include the question, audience, dataset, and purpose.
Student accepts AI feedback too quickly	Revision follows AI advice even when it does not fit the data	Ask students to justify why the suggestion fits the evidence and audience.
Student rejects AI without explanation	Student says "AI was not useful" but does not explain why	Ask students to identify what made the suggestion unhelpful, such as missing data, vague advice, or mismatch with the question.
Reflection is superficial	Student writes, "AI helped me" without examples	Ask for one specific moment when thinking changed or a suggestion was accepted, revised, or rejected.

Table B5. Common Student Challenges and Teaching Responses

6. Optional AI Prompt Guidance

Students may struggle to write useful AI prompts, especially if they are used to asking AI broad questions. The goal is not to give students a script to copy. The goal is to help them understand that effective AI prompting requires context, purpose, and judgment. Table B5 provides sample prompts instructors may share or model. Remind students

that AI output is a suggestion, not a result. Any figure, calculation, or interpretation an AI tool produces must be checked against their own visualization before it enters the data story.

Assignment Part	AI Role	Purpose of AI Use	Sample Prompt
Part 1	Tutor	Refine the business question or metric	"I am working with a fast food nutrition dataset. My initial question is (insert question). How can I make it more specific and better aligned with the data I have?"
Part 1	Tutor	Check what the dataset can support	"What should I be careful about when interpreting a nutrition dataset that does not include sales or customer preference data?"
Part 2	Collaborator	Improve visual clarity	"I created a chart comparing (measure) by (company/category). My question is (insert question). How can I make this visual clearer for a non-technical audience?"
Part 2	Collaborator	Evaluate chart choice	"Does this chart type fit my question? My question is (insert question), and the fields I am using are (insert fields)."
Part 3	Audience Proxy	Test communication clarity	"Here is my short data story: (insert story). Pretend you are a restaurant executive. What is clear, and what needs clarification?"
Part 3	Audience Proxy	Strengthen evidence based communication	"Does this explanation clearly connect the data to the business question? What evidence would make it stronger?"
Part 4	Reflective Partner	Reflect on learning	"I used AI at different stages of a data analytics project. What might this reveal about my learning process or growth as an analyst?"
Part 4	Reflective Partner	Reflect on responsible AI use	"What are signs that I used AI responsibly in this project? What should I watch out for in future analytics work?"

Table B6. Optional AI Prompt Guidance by Assignment Part

Instructors should remind students that prompt quality matters, but the final decision remains with the student. Students should be encouraged to revise AI suggestions, reject suggestions that do not fit the dataset, and explain their reasoning.

7. Adaptation Options

Course Context	Possible Adaptation
Limited visualization experience	Require fewer visuals, allow screenshots instead of dashboards, and emphasize question framing and interpretation.
More advanced visualization preparation	Require calculated fields, filters, interactivity, dashboard formatting, or more detailed visual design expectations.
Short module	Combine Parts 3 and 4 or reduce the number of required AI interactions.
Longer project	Provide feedback after each part and require more developed revisions across the project.
Team based implementation	Allow teams to create shared visuals or dashboards, but require individual reflections so each student's reasoning remains visible.
AI restricted environment	Replace AI feedback with peer feedback or instructor provided feedback while keeping the same pre feedback and post feedback structure.
Limited time available	Combine the Section 2C, 3C, and 4A short reflections into a single reflection at the end of Part 4, or reduce each to one or two sentences. Keep the Part 4 process level reflection intact, since it carries the most reasoning.

Table B7. Adaptation Options

8. Minimum prerequisites before adopting this activity

Students should be able to:

- Open a dataset in the visualization tool and identify its fields
- Build a basic bar or column chart and apply a filter
- Group or aggregate a measure by a categorical field
- Access a generative AI tool and have used one at least once

Instructors should have prepared:

- The dataset, worksheets, and rubrics
- A stated policy on uploading data to AI tools
- One worked example per part for in-class modeling