QE Data Challenge 2026

Group 11

Group Members

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Chosen Coded DataSet

Nephrotex

Virtual internship where students designed a biomedical device for dialysis machines.

Key Columns & Metadata

- **content:** The primary discourse data.
- **uniqueuserid:** Unique identifier for each student.
- **chatgroup:** The specific team students were assigned to.
- **roomName:** The specific internship activity being completed.
- **site_x:** The school the student attended.
- **OutcomeScore & OutcomeBins:** Performance scores and binary (1/0) outcome designations.

Coding Methodology

Deductive Coding Approach

The coding scheme was based on predefined coded variables in the dataset.

Refinement & Examples

Chat content was reviewed to **clarify code meanings** and **prepare examples**.

Dataset Volume: Approximately 45,000 coded chat lines.

ENA Preparation: Analysis checked unit structure, outcome groups, and code variables for Epistemic Network Analysis.

Codes

Code	Definition	Example
m_experimental_testing	Discussion related to testing, experimenting, or checking whether a design or idea works.	“We should test this design and see if it works.”
m_making_design_choices	Discussion about selecting, deciding, or changing design options.	“Let’s choose this material for our final design.”
m_asking_questions	Questions asked to clarify information, understand the task, or support decision-making.	“What should we do next?”
j_customer_consultants_requests	References to customer needs, consultant suggestions, or external stakeholder requests.	“The customer asked for a stronger structure.”
j_performance_parameters_requirements	Discussion about performance criteria, requirements, constraints, or expected design standards.	“It needs to meet the weight and strength requirements.”
j_communication	Communication among team members, including sharing information, coordinating, or discussing ideas.	“Can you explain your idea to the group?”

Codes

Code	Definition	Example
Design_Justification	Explanation or reasoning used to support a design choice or decision.	“We chose this shape because it will be more stable.”
Stakeholder_citations	References to stakeholders, users, clients, or people affected by the design.	“This will be easier for the users to operate.”
Team_skills	Discussion related to teamwork, roles, skills, collaboration, or team capability.	“You are good at drawing, so you can make the sketch.”
Technical_Resources	References to technical tools, materials, information, resources, or technical knowledge.	“We can use the simulation software to check the result.”
Testing_Plan_Logic	Logical explanation of how, why, or when testing should be conducted.	“First, we test the weak part, then compare the results.”

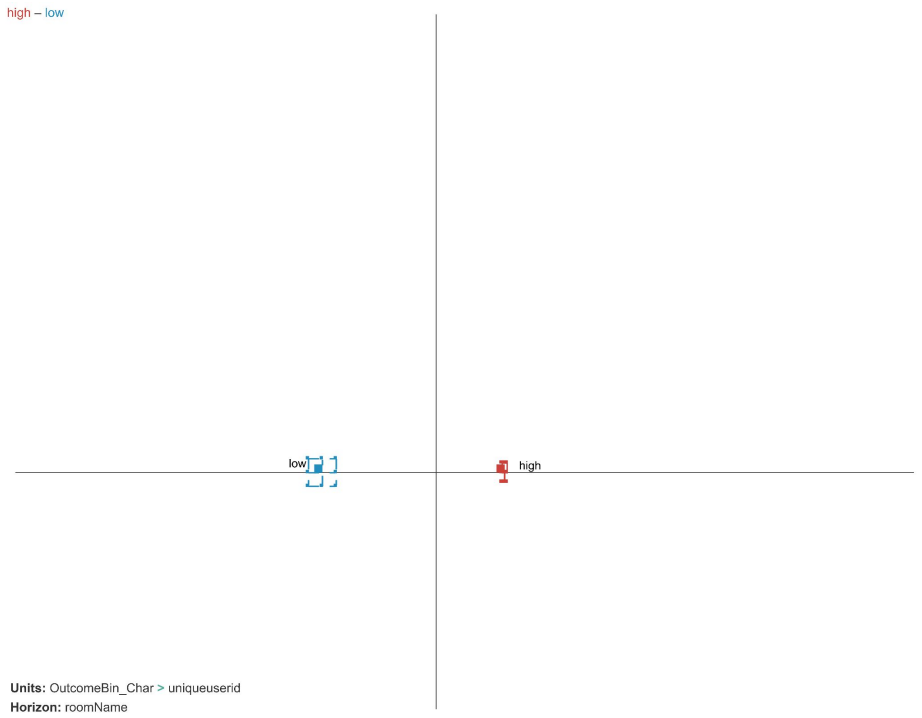
1 Main ENA Comparison

How do discourse network patterns differ between high- and low-outcome groups across all participants?

ENA setting	Selected Column
Unit of analysis	OutcomeBin_Char, uniqueuserid
Horizon	roomName
Window Size	4
Codes	The 11 coded variables
Group comparison	OutcomeBin_Char

Unit structure: OutcomeBin_Char > uniqueuserid
Reason: Participants were nested within outcome categories to compare user-level discourse networks between High and Low groups.

Position of Group Means



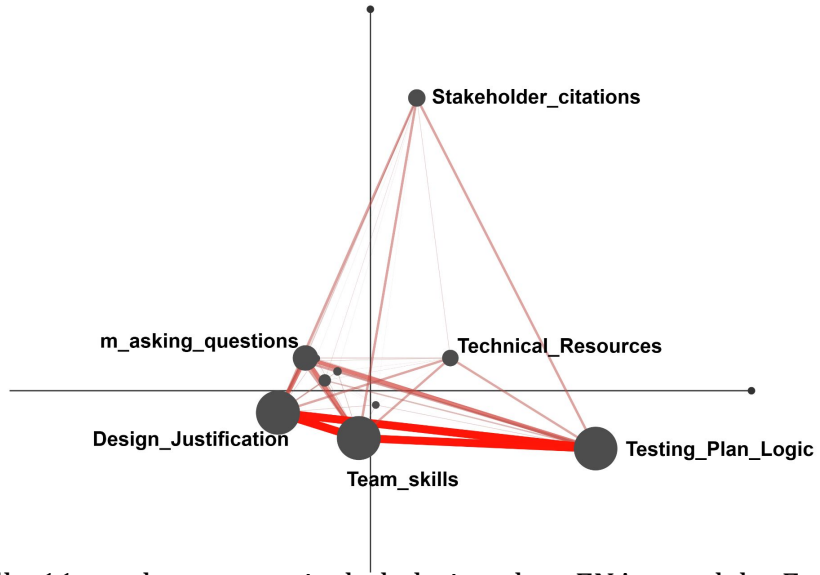
Key Observation

The high- and low-outcome groups occupied **different regions** of the ENA space.

This suggests that the two groups showed **distinct patterns of connections** among coded discourse elements.

Strong Connections in the High Group

high



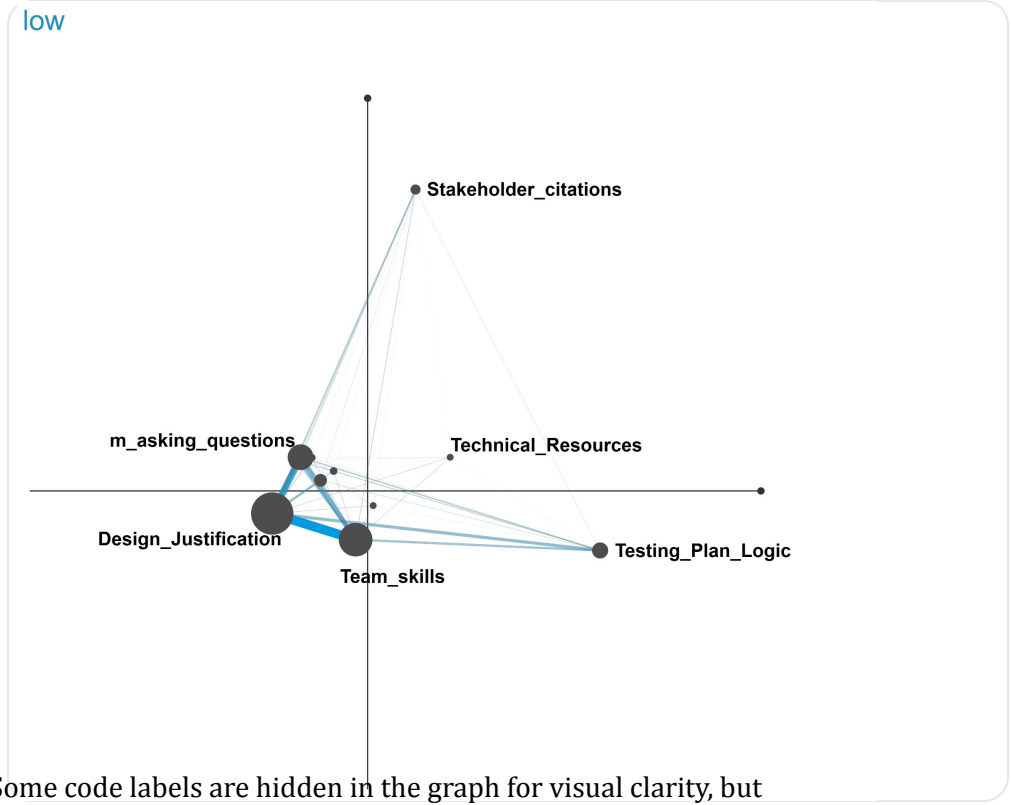
All 11 codes were included in the ENA model. For graph interpretation, only the most relevant code labels are displayed to improve readability.

Key Insight

High-outcome participants tended to connect **design justification** with **testing-plan logic** and **team skills**.

Successful participants did not only discuss design ideas separately, but connected their reasoning to testing plans and collaborative team processes.

Strong Connections in the Low Group



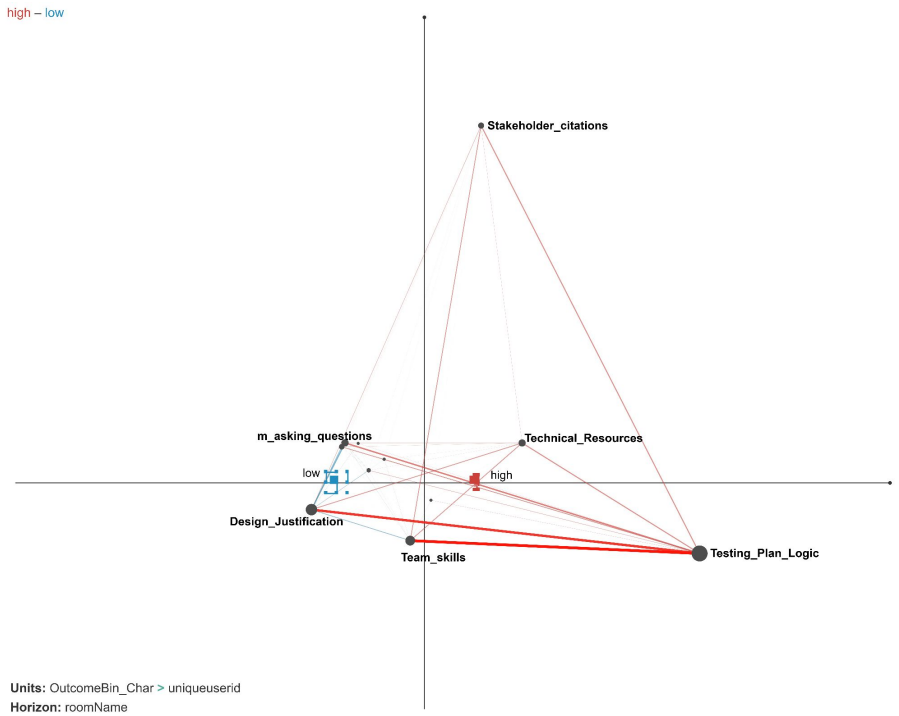
Some code labels are hidden in the graph for visual clarity, but all 11 codes were used in the model.

Key Observation

Low-outcome participants showed **fewer connections** involving **testing logic** and **technical resources**.

This may indicate that their discussions were less strongly connected to systematic testing and evidence-based design reasoning.

Comparison Plot

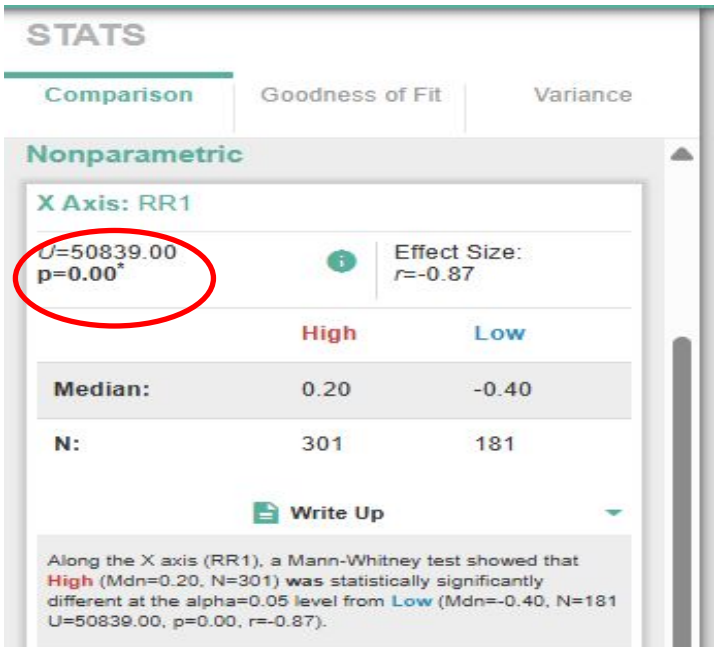


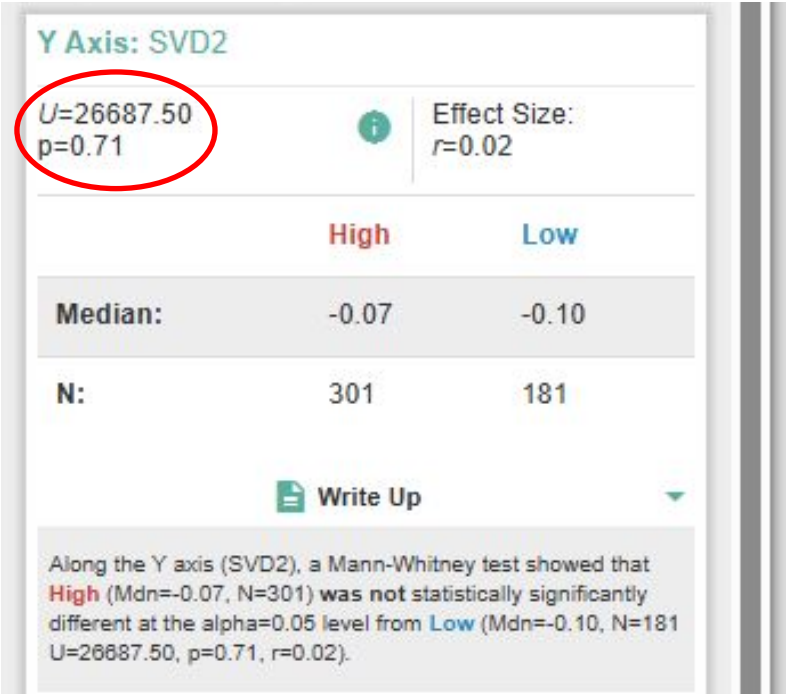
Some code labels are hidden in the graph for visual clarity, but all 11 codes were used in the model.

Visual Summary

The graph represents the **high and low group connections** plotted in a single frame.

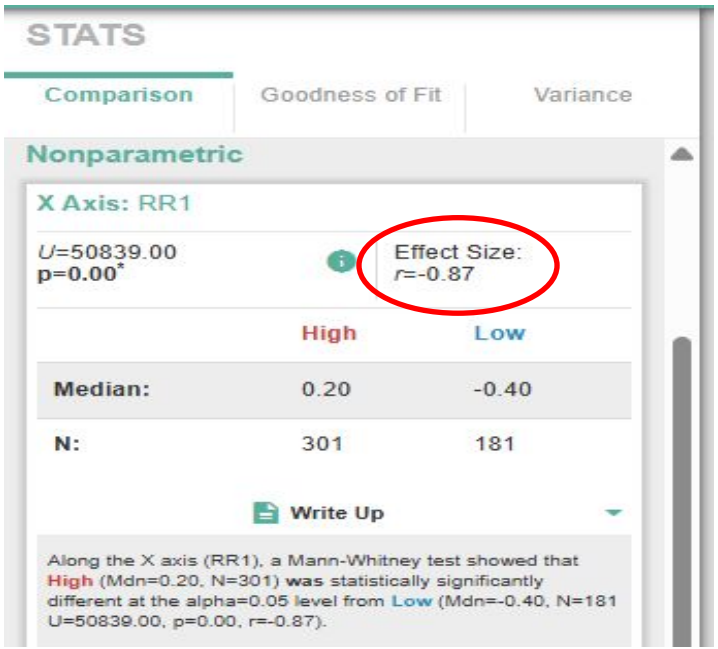
Non-Parametric Analysis Result

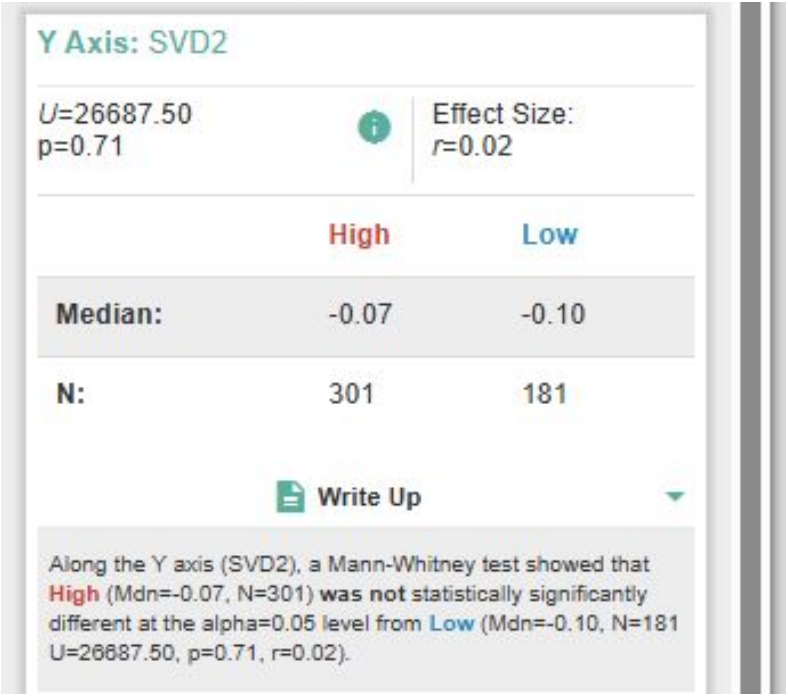




High- and Low-outcome participants showed significantly different discourse network patterns along the **X-axis**, but not along the Y-axis. The **important separation is mainly horizontal**.

Non-Parametric Analysis Result



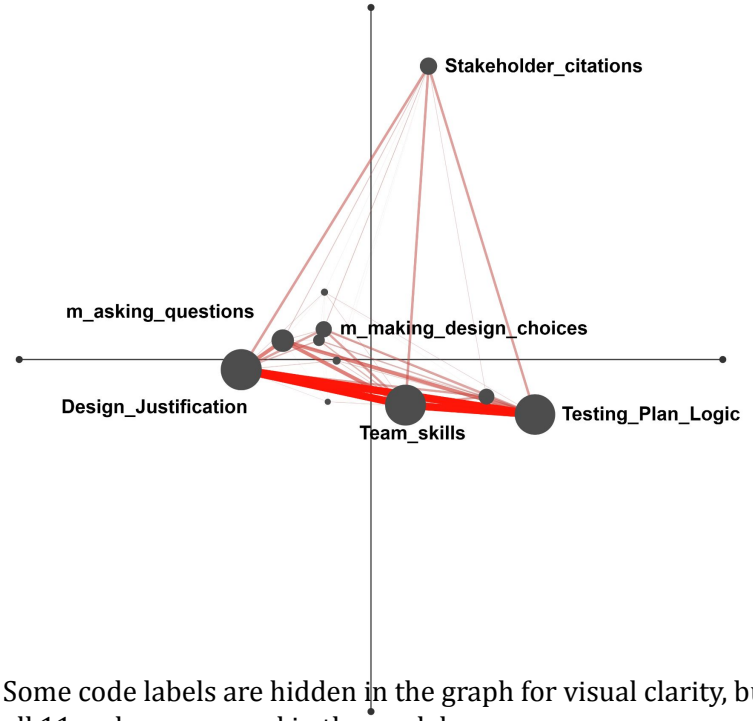


The **very large effect size** means that the difference between High and Low groups is not only statistically significant, but also practically meaningful. In other words, the **two groups showed clearly different patterns of coded discussion** along the X-axis.

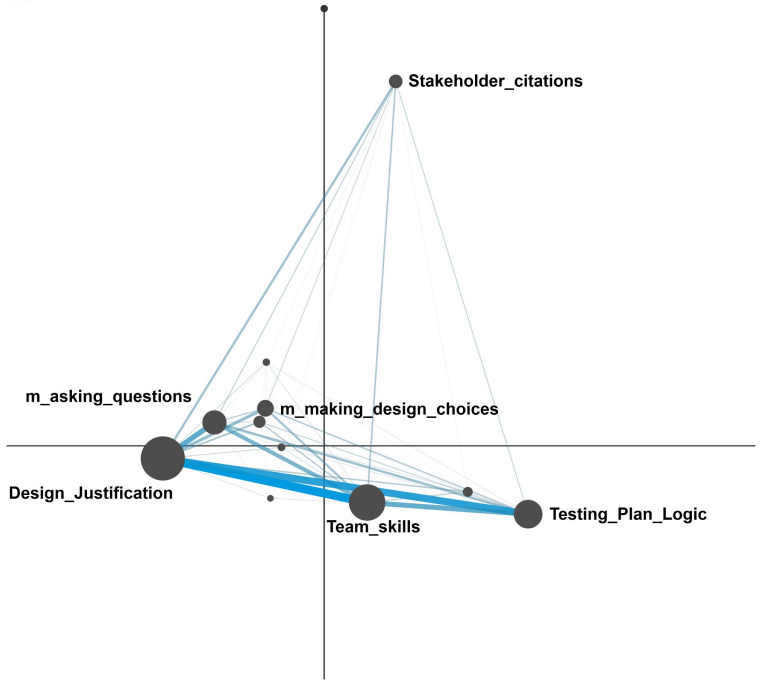
2 Player only ENA

How do discourse network patterns differ between high- and low-outcome groups among players only?

high

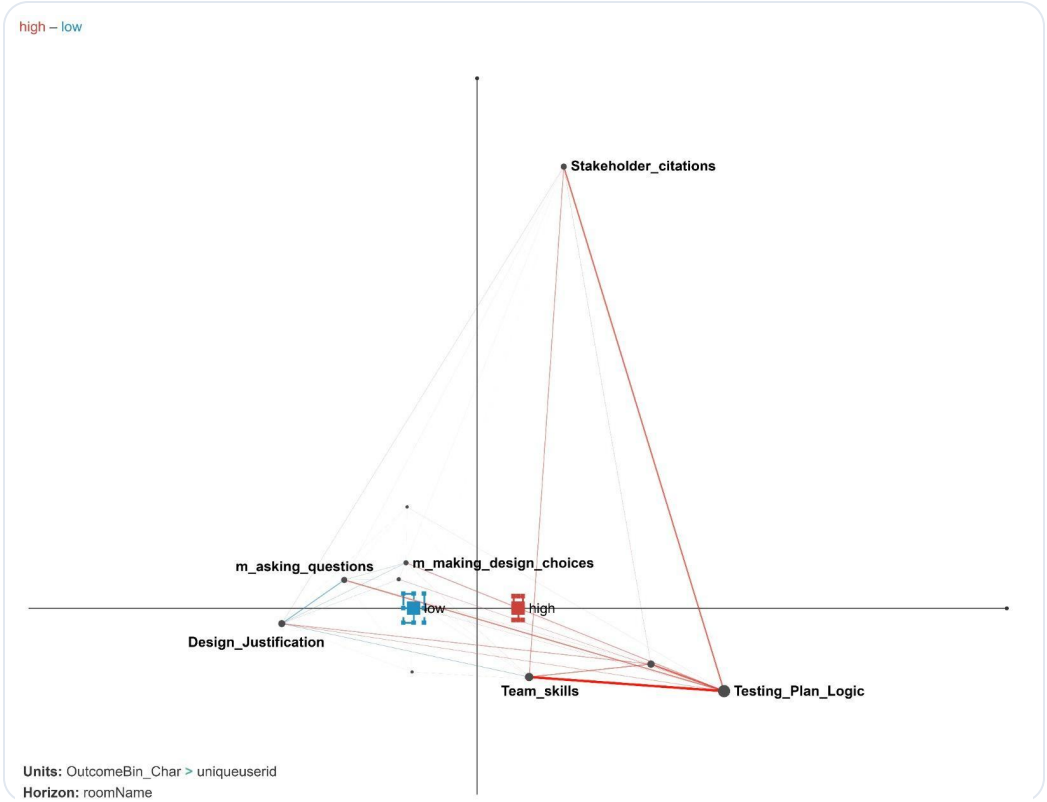


low



Some code labels are hidden in the graph for visual clarity, but all 11 codes were used in the model.

Player only ENA



Some code labels are hidden in the graph for visual clarity, but all 11 codes were used in the model.

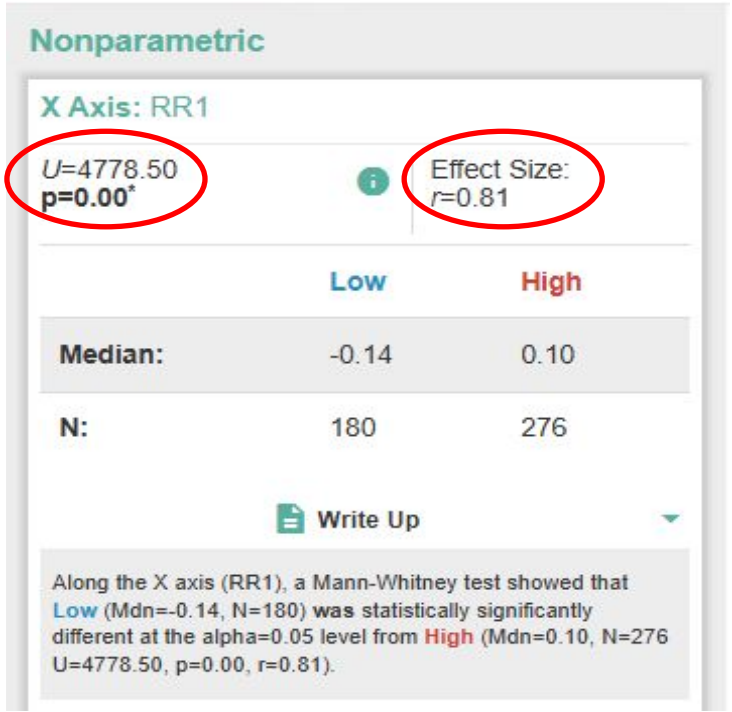
Model Insights

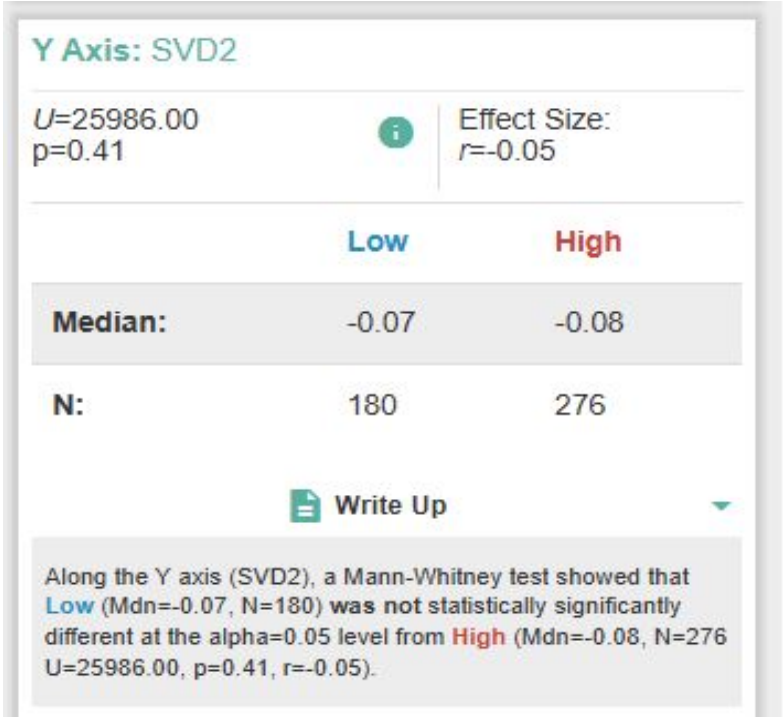
In the **player-only ENA model**, high-outcome players showed stronger and more integrated connections among *Testing_Plan_Logic, Team_skills, Stakeholder_citations,* and *m_making_design_choices*.

High-performers connected design decisions with testing logic and teamwork.

Low-outcome players focused more on *Design_Justification* and *m_asking_questions*, showing fewer connections to planning.

Non-Parametric Analysis Result

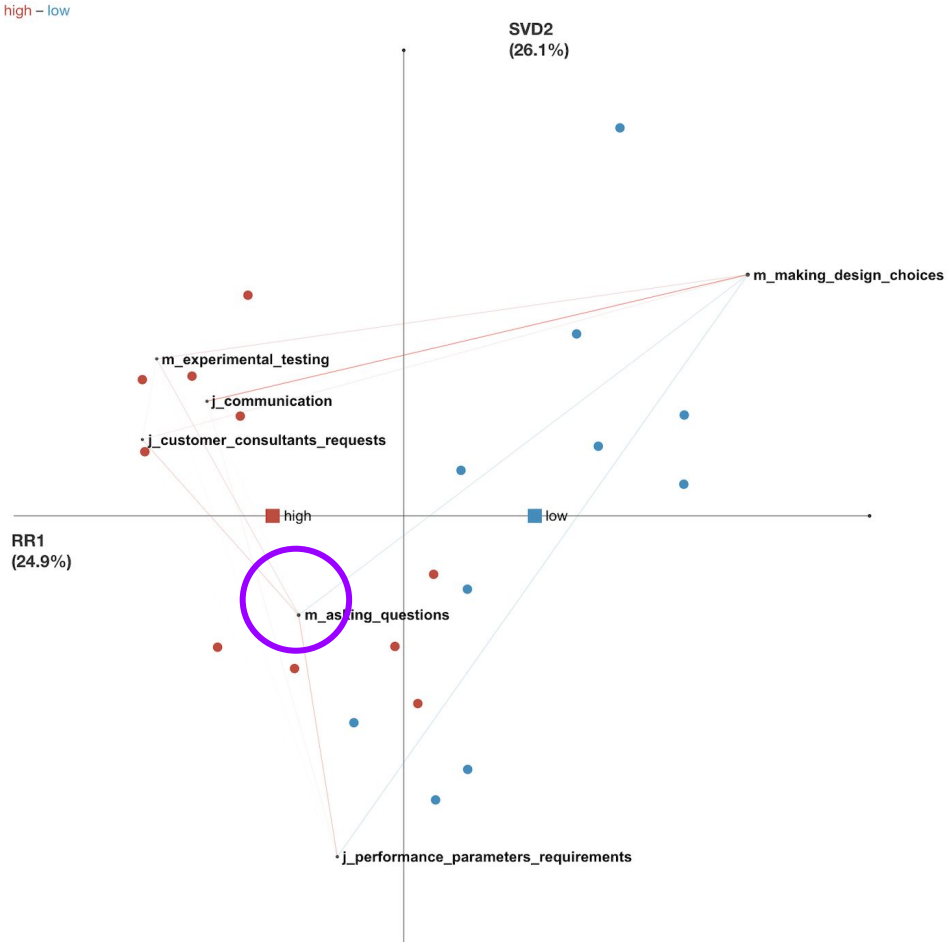




High and Low players had clearly different discourse network patterns along the X-axis. The effect size was very large, which means the difference was not only statistically significant, but also meaningful.

Future Analysis will include

- High vs Low among Mentor only
- Different ChatGroups
- Different roomName/activity stages
- OutcomeScore instead of high/low



Note: To more rigorously compare high- and low-outcome groups, the mentor group was excluded as an outlier in the visualization.

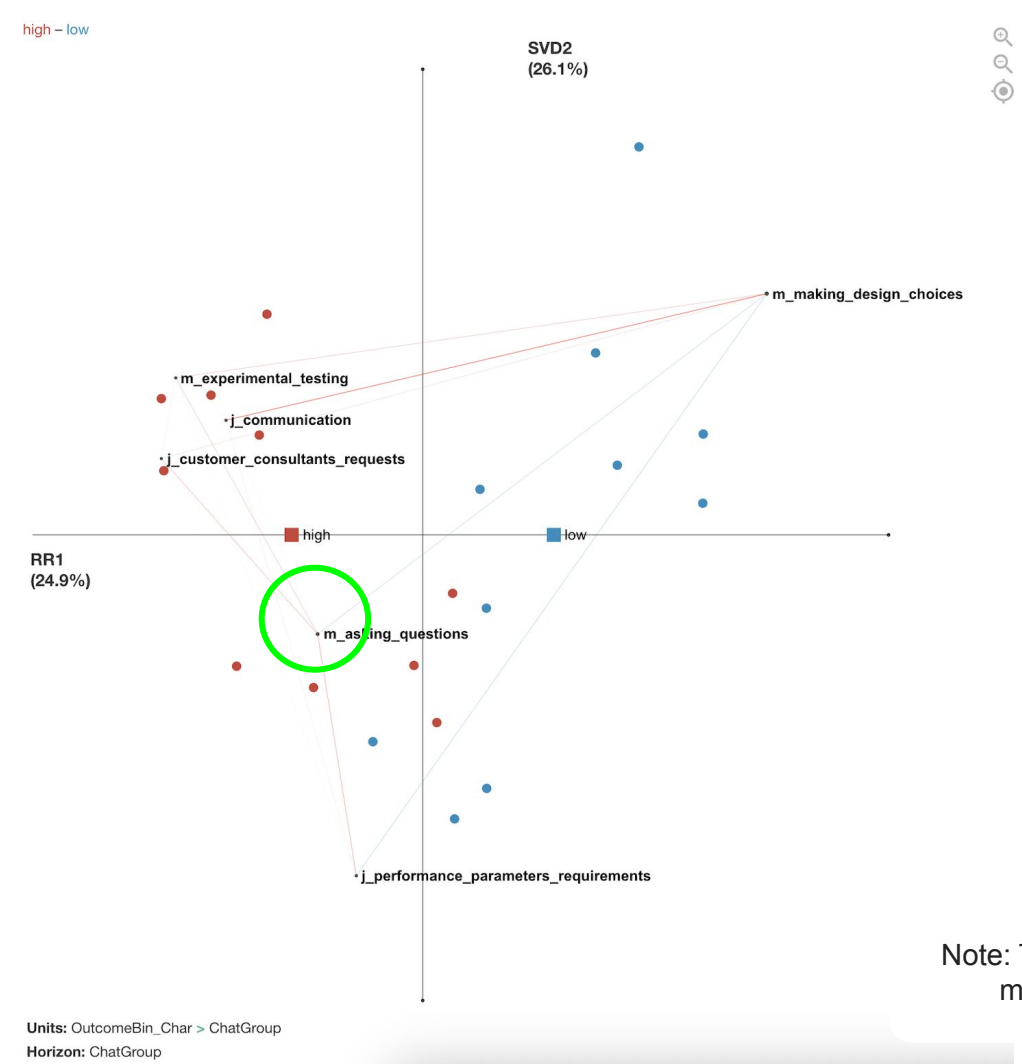
Possible Direction for Further Analysis: Refining the "Asking Questions" Code

1. Modify the coding scheme

- We could consider breaking down the current code **"Asking Questions"** into more specific subcategories.
- For example:
  - Clarification questions
  - Decision-oriented questions
  - Evidence-seeking questions
  - Coordination questions

2. Start with a subset of the data

- Since coding the entire dataset would be a substantial task, it may be more practical to first test the revised coding scheme on a **characteristic subset** of the data.



Possible Direction for Further Analysis: Refining the "Asking Questions" Code

3. Beyond High vs. Low comparison

- Instead of only comparing **High vs. Low** groups, we could also build a model that captures different patterns of questioning.
- This may help us understand not only how often students ask questions, but also **what kinds of questions they ask and how those questions function**.

Note: To more rigorously compare high- and low-outcome groups, the mentor group was excluded as an outlier in the visualization.