Mental Model Content
- Diversity of mental models
  - Diversity of abstractions and idioms/representations (MM1)
  - Ordering diverse, personal (OG1)
    - Caveat: Participants draw in order of reading (OG2)
  - Diversity of groupings (OG3)
- Components of mental models
  - Physical objects represent data (MM6)
  - Tree/Network/Set ambiguity (MM3)
  - Include affordances (MM5)

Themes about Mental Model Content

Theme	Code	Representative example/Evidence
Diversity of mental models	Diversity of abstractions and idioms/representations (MM1)	For the power station data, we saw tables (4), set/geospatial (1), bar charts (2), node-link networks (2), set (1), table and node-link (1), and a multi-figure "journal paper"-like representation (1) that included captions and text.
	Ordering diverse, personal (OG1) * Caveat: participants drew in order of reading (OG2)	Participant 016 (JD) organized by desired category of "durability" based on personal experience.
	Diversity of groupings (OG3)	Grouped by functionality (2), participant-selected category (2), grouped only the writing implements (2), list order (i.e. no grouping) (4)
Components of mental models	Physical objects represent data (MM6)	Participant 008 (PS): "I've seen a lot of power plants back home… that's why I drew the cooling towers." Participant 013 (JD): "There's a red pencil case that I had during my last year of high school and these are the pens that I have right now in college."
	Tree/Network/Set ambiguity (MM3)	Participant 018 (FS) used terms "set" but also "level" and "nesting." Drew a

		node-link initially but said they considered a nested drawing (shown in bonus for 018).
	Mental models include affordances (MM5)	Participant 022 (JD) drew a basket with a handle "so it's organized in a way and you can carry it around." 5/9 participants who had the FS dataset spoke about interactions.

Mental Model Elicitation
- Depictions of mental models
  - Used text to clarify (D3)
  - Legends/verbal legends (D5)
  - Use abstractions in depiction (D1, D6) -- sometimes laziness, sometimes deliberate choice of icon/symbol
  - Constrained by sketches (D2) -- supported by literature. Representations of internal phenomena are imperfect
  - Add details to clarify (D4)
- Communication with others
  - Conflict of terminology used (C2)
  - Range of description detail (C3) from literal to abstract/overview
  - Changes to depiction for communication (C1)

Themes about Mental Model Elicitation

Theme	Code	Representative example/Evidence
Depictions of mental models	Used text to clarify	Participant 009 (FS) calls the files ".java" so that "we can be more explicit."
	Legends/verbal legends	Participant 006 (FS) verbally explained the icons used for file types. Participant 032 (PS) made a legend.
	Used abstractions in depiction (sometimes laziness, sometimes deliberate)	Participant 008 (PS): "...just repeating the picture of the power plant but then I got lazy and then just drew a square for the power plants."

	Constrained by sketches	Participant 007 (JD): added Sharpies outside of pencil pouch because "I didn't make the pouch big enough." Participant 016 (JD): "I had to skip back here (left) to fill out the rest of the space."
	Added details to clarify	Participant 020 (PS): suggests adding weights to directed arrows, "it would be an improvement."
Communication with others	Conflict of terminology used	Participant 006 (FS) drew something closer to a node-link diagram but their description was more set-like ("levels", "within", "in the folder").
	Range of description detail from literal to abstract/overview	5 participants did not describe the drawing and instead restated the dataset (4/5 were CS-related participants). 15 participants gave a visual description of the icons and marks (13/15 were CS-related participants). 8 participants named a data abstraction or data chart type (4/8 were CS-related participants).
	Changes to depiction for communication	Participant 021 (FS) said they would draw the tree left to right to better communicate with others and attempted to add interaction indications.

Mental Model Formation
- Mental model formation process
    - Immediate mental model formation (MM2)
    - Mental model did not vary much or at all for 17/28 participants
        - Caveat: changed significantly for 4 participants due to changes in data abstraction representation
    - Mental models become more detailed (MM4)

- Mental model formation influences
  - Explicit mental model origins (MM7)
  - Purpose
    - Assume tasks (PS3)
    - Suggest data generators (sources) (PS2)
    - Desire to add data/information (PS1)
    - ~~Connect to Walny's F statements (statements with analytic potential)~~
      - This has implications for designers to elicit corner cases, tasks, alternative contexts from users
  - Lower math literacy works against mental model (MM8)

Themes about Mental Model Formation

Theme	Code	Representative example/Evidence
Mental model formation process	Immediate mental model formation	Participant 024 (PS): in response to the first question, "My gut reaction was like an image of - I dunno if you know cell-free MIMO graphs..."
	Mental model did not vary much or at all for 17/28 participants *Caveat: changed significantly for 4 participants due to changes in data representation	Participant 018 (FS): "No, I mean I kind of saw it for how I was gonna do it right away and stuck with that." Participant 016 (JD) considered "maybe there's a better way to accurately display-- because it sounds like this is someone inventorying the items...I wish there was a way that I could highlight that, or draw attention to that this [the stamp roll] is probably more important than rubber bands and tacks
	Mental models became more detailed	Participant 013 (JD): "In the beginning I was just thinking about the basket and thenI started to remember how things were more clearly, so I started drawing slightly more elaborately and really thinking about what I wanted to draw."

Influences on the mental model formation	Explicit mental model origins	Participant 006 (FS): "The [Windows] file system, the file structure, has definitely left a mark on me."
	Purpose-seeking: Participants added or assumed tasks	Participant 019 (JD) associated the dataset with cleaning or organizing their desk. Participants 011, 014, 032 (PS) all sought to discover ultima (e.g. the maximum power produced).
	Purpose-seeking: Participants suggested data sources	Participant 017: "I dunno, it's a power station, it's probably a municipal guide or a power company's guide to how to distribute power."
	Purpose-seeking: Participants desired to add data/information	Add data attribute: Participant 029 (PS) wanted to add people per house. Add relationships: Participant 013 (JD) wanted to add relationships between items. Add naming schema: Participant 018 (FS) wanted to add folder names.
	Lower math literacy works against mental model	Participant 023 had difficulty with the multidimensional aspect of power station data, drops the power stations' label dimension (i.e. A--F labels).